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THE PLAGUE.

I.

THE RECENT AND PRESENT OUTBREAKS IN HONG-KONG AND INDIA.

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The plague, a name not likely to be superseded, bears a strong resemblance in its etiology and pathology to typhus, in the severer cases of which petechiæ, hemorrhages, and even the most characteristic phenomenon of the former disease—glandular inflammations—may be met with. It is often called bubonic plague, but inaccurately, since in a minority only, indeed, if we recognize the "pestis minor" as a "pestis metior" differing chiefly in severity, in a very small minority of cases does suppuration occur. Known to the Greek physicians, and introduced into Europe in the sixth century, if not earlier, for more than a thousand years it from time to time decimated the nations, but disappeared from Great Britain about the end of the seventeenth century, and from Western, Southern, and Central Europe toward the close of the eighteenth century; though Malta was involved in a Levantine epidemic in 1813, and it lingered on the lower Danube and the shores of the Black Sea until 1840, while Russia has been frequently, and quite recently, invaded *via* Astrakhan.

It is endemic in Arabia, Syria, the Euphrates Valley, Persia, Central Asia, and Southern China, whence it has within the present century made inroads along the northern coast of Africa, across the Himalayas, and into some of the islands of the far East, but has never approached the equator or crossed the oceans on either side. Like typhus, it follows wars and famines, and is favored by poverty, filth, and overcrowding;

conditions, be it remembered, by no means necessarily connoting density of population; existing, indeed, in far more aggravated degrees on the bleak steppes of Turkistan than in the populous cities of the Ganges Valley, though unknown in equatorial regions, where men can find food without labor, and clothes and houses are rather inconveniences than otherwise.

Aryans, Semites, and Mongols have suffered alike at different times, and the facts that Europeans in Asia enjoy comparative immunity, and that it has never prevailed as an epidemic in India save in years of famine, seem to point to social conditions rather than to racial differences in explanation of its geographical distribution, both in the present and in the past, unless it be true that the Japanese, the cleanest people in the world, are as susceptible as the Chinese, who are the filthiest of civilized races; but this is doubtful, since two of the three Japanese medical men who were attacked in Hong-Kong contracted it apparently by inoculation in the post-mortem room, while the Chinese hospital assistants, conforming to European habits, escaped.

Its prevalence in the Chinese province of Yunnan excited no attention; but Hong-Kong was invaded from Canton in 1894 and in 1896, and some cases occurred in Singapore and Borneo. On each occasion the incidence of the disease was mainly on the Chinese population, among whom the case-mortality in 1894 could not have been much under 100 per cent.—that among the hospital patients having been 93 per cent., and no account having been taken of the numerous dead bodies found daily in the streets. In 1896, whether from the disease being of a milder type, or, as is more probable, from better medical and sanitary measures, the total mortality among the Chinese was 89 per cent. of the persons attacked, whether in the hospitals or in their homes, but the European colony suffered more than in 1894. In that year the only Europeans attacked were the soldiers of the Shropshire Regiment, who volunteered to assist the municipal authorities in scavenging and sanitary work, in which they were exposed to the inhalation of highly infected dust; the medical and nursing staff escaped entirely, the two sisters of the Italian convent who succumbed having been Eurasians coming from very poor homes, and the three Japanese medical men, one of whom died, having been engaged in post-mortem examinations and pathological research. In 1896 the cases other than Chinamen were only twenty-two, viz., six Europeans, with four deaths; fifteen Indians, with six deaths; and one native of Siam, who died. Two of the Europeans were nursing-sisters, an English and an Italian lady, the latter dying.

As to the susceptibility of the lower anmials to the plague there is some difference of opinion; but this much is certain, that while it has never been observed in cattle, jackals, dogs, and pigs are attacked after devouring corpses, which in China are often left exposed. In Hong-

Kong, on the other hand, the dogs did not suffer because the dead were promptly buried by the authorities, if not by their friends. Rats, however, are attacked in every place, not only during an epidemic, but before the disease appears among the population, so constantly indeed that in China and among the Himalayan tribes one of the names by which it is known is that of "rat's disease," and it is remarkable that the first cases in Bombay were among the coolies employed in unloading ships from China and in the granaries. How far the rats act as intermediaries or vehicles of infection, and whether they in the first contract the disease from man, or *vice versa*, are at present matters of speculation.

In endeavoring to trace the origin of an epidemic, especially of any disease which, like cholera, yellow fever, smallpox, or that under consideration, is apt to be introduced into a community from without, and in devising measures for preventing its importation or its spread, it is necessary to have an accurate conception of the means and vehicles of infection and of the incubation and infective periods.

There is no doubt that the incubation-period is short—not exceeding a week. Dr. Lowson puts it at three to six days, while Dr. Aoyama is inclined to extend the time by a day at each end. How long after recovery a patient is liable to communicate the infection to others is not, I believe, determined. As to the mode of infection, we must at once dismiss from our minds the ghastly mediæval tales of inevitable contagion and certain death, which would paralyze all human effort. Not that we need discredit them, for we see them repeated in the widespread and appalling case-mortality which still prevails whenever the plague obtains a foothold among peoples, who, whether habitually or under the stress of famine, whether in the city or desert, and in whatever climate, herd together in mud-floored hovels, reeking with filth within and without, dirty in their persons and clothes, and with insufficient, coarse and sour, or unwholesome food. The conditions of the poorer classes in the cities of Europe in the middle ages, and even in some until the beginning of the last, perhaps I might have said present, century, were little, if at all, better than those which are now met with among Arabs, Kurds, and Chinese; but *tempora mutantur et nos mutamur in illis*. Within the last fifty years many physicians, as Drs. Bartoletti, Cabiadis, and Lowson, in Turkey, Tripoli, and Hong-Kong, respectively, have treated—nay, handled—thousands of patients with impunity, though for the most part in well-ventilated hospital-sheds; whereas hundreds of Russian army surgeons fell victims to the typhus so called, though it was probably the plague (if, indeed, there be any essential and specific difference between these diseases), in the campaigns of 1828 and 1876 on the Danube and in Armenia, where, as in so many wars, the medical and commissariat arrangements were wholly unequal to the strain. Theories of a tainted atmosphere and of infection by the breath or by exhalations from the

bodies of the sick were satisfactory enough so long as the poison was supposed to be a subtle emanation, whether of telluric or of animal origin; but, like the hypothesis of the "distal aërial diffusion" of smallpox, are scarcely compatible with the recognition of contagia as ponderable, particulate living bodies, requiring a liquid or moist surface for their growth, though capable of retaining their vitality when desiccated and floating in the air as dust, and to resuscitate and resume their activity when inhaled or ingested. In fact, inhalation of infected dust, handling of fomites, and "eating with" soiled and "unwashed hands," are the real and actual modes of infection commonly spoken of as aërial or by contact. Thus, while the medical men and all but four of the nurses in attendance on the sick at Hong-Kong from 1894 to 1896 escaped entirely, the victims were almost exclusively among the soldiers engaged in shovelling the filth from the floors of infected houses and in tipping it from the carts for burning; and when the removal was not commenced until the filth had been saturated with the acid liquid used for evolving chlorine this operation ceased to be attended with danger. None of those who removed the corpses for burial, carrying them by their pigtails and feet and avoiding contact with their soiled clothing, were attacked.

I have already alluded incidentally to a mild and more chronic form of disease known as the "pestis minor," which appears to keep alive the infection and to serve as a connecting-link between the great epidemics. It is marked by the same disseminated adenitis as the typical plague, and by a certain amount of fever; though it runs a course of indefinite duration, and, as a rule, terminates in recovery, unless, as sometimes happens, after many days or even weeks, during which the patient has perhaps been scarcely conscious of being ill, it suddenly develops into an attack of unmistakable and probably fatal plague. It is true that no such dimorphism is known in the case of the other acute specific diseases, as smallpox, scarlatina, etc.; but I think that we have a strictly parallel phenomenon presented in the relation of farcy to glanders, in which modern pathologists recognize but a chronic and an acute form of one and the same disease, the identical bacillus being present in each; and since the discovery by Kitasato of the specific bacillus of the plague in the acute cases at Hong-Kong two years ago, it has been identified by several observers in cases of the minor or chronic disease, though apparently attenuated and of less toxicity. This discovery is of the utmost interest and importance, serving to explain the recent instances of the introduction of the plague into Calcutta, and still more the occurrence of two cases on board vessels in the Thames, for which one must otherwise have had recourse to conjectural fomites, or to the unwarrantable hypothesis of an extraordinarily prolonged incubation. This dimorphism, as I have termed it, is, of course, a

wholly different phenomenon from that of the mild and unrecognized cases of cholera, diphtheria, and scarlatina, which frequently usher in an epidemic of these diseases, arousing no suspicion of the danger until it is too late to avert it, and baffling endeavors to trace the disease to its origin. But long ago, on purely clinical and etiological grounds, Foderé at Marseilles in 1820, Tholazon in Persia in the sixties, Dickson in Bagdad, and others more recently recognized the connection, Foderé expressing the decided opinion that the pestis minor, benign and non-fatal though it was, "was not less the plague and no less merited the attention of physicians and of magistrates," a position now confirmed by bacteriology and clinical observation.

The first official announcement of the appearance of the plague in Bombay was at the meeting of the sanitary committee on September 23d, when Dr. Viegas stated that it had been present in the city for a fortnight; but it must have been recognized by the native population for two or three months, since pilgrimages to propitiate the goddess of this disease had been organized in the Maudvie, a suburb inhabited by the poorest class. Bombay is in every respect the very opposite of Hong-Kong, which is built on a lofty granite rock, with an unimpeachable water-supply, and in the European quarters a separate system of sewerage with steep gradients, being, in fact, a model of sanitary perfection. There not only the European civil population but their Chinese servants enjoyed absolute immunity. Bombay, on the other hand, lies low, the sewers are defective, with insufficient fall, the soil is sewage-sodden, and the city surrounded by swamps. In November the disease, which had seemed to be abating, revived and the mortality steadily rose; but the official returns, which gave the total deaths up to the middle of January as 2500, are certainly grossly below the truth. Segregation of infected houses and persons was tried, and relaxed or abandoned by turns, and, as might have been expected, with little or no success, seeing that a "house" in the poorer native quarters contains three hundred to six hundred or even more occupants. The fears and prejudices of the people led them to conceal the existence of the disease, while the native medical men, and even the European, yielding to the entreaties of the friends, certified the deaths as "remittent fever," "pneumonia," etc. That in December fifty deaths occurred daily from remittent fever in an urban population is utterly incredible, or that, in the absence of any epidemic of cholera or other disease than the plague, the general death-rate of the city should have risen to between four and five times its normal figure, save from this one cause, is inconceivable. Nor have the Europeans escaped, several deaths having already occurred not only among medical officers, but among civilians. A general exodus of the native population threatens to spread the plague throughout the famine-stricken provinces, and already several hundred deaths

have been reported from Karachi, the second largest seaport on the west coast, and a considerable number at Poonah, which is usually deemed a very healthy station; while "sporadic" cases are cropping up on all sides. From Calcutta conflicting accounts are received; since the arrival last October of a case of pestis minor (?) from Bombay, which shortly assumed a typical character, many have been reported, either as plague or *bubon d'emblée*, or under other more or less equivocal denominations. The bacillus of the plague has been identified in several of these; but the disease is at any rate of a milder type, and with a far lower mortality than at Bombay. The men of the Shropshire Regiment which did such noble service at Hong-Kong, and is at present stationed at Calcutta, have suffered extensively from non-venereal buboes. The sanitary conditions of Calcutta, especially in the native quarter, are even worse than those of Bombay, so that the outlook is grave in the extreme should the disease assume a severer character. The approaching pilgrimage of devout Mussulmans to Mecca and other holy places is calculated to give cause for serious alarm as to the propagation of the epidemic not only in Arabia, Persia, and the Euphrates Valley, but its subsequent conveyance onward by Mohammedan pilgrims from the Levant, Algeria, Southern Russia, and Bosnia, returning to their homes on the shores of the Mediterranean and Black Sea and the valley of the Danube; the more so, as ten cases have already been detected in the port of Marseilles.

II.

ITS GERM AND TRANSMISSION.

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The appearance of the bubonic plague in the East during the past two years finds the world, for the first time, prepared to investigate scientifically the cause of its development and indicate the means of relief. The investigations undertaken have already in a measure been successful, and the value of the results will be better appreciated after reviewing the past history of the plague, which shows the complete helplessness heretofore of the people and the authorities to restrict its ravages.

There is no doubt as to the antiquity of the bubonic plague, which has during the past two thousand years been variously described by writers under the name of Levantine, Oriental, or Bubonic Plague, and the Black Plague or Black Death, etc. These designations are open to criticism, as they are more or less misleading and without scientific foundation. Different names have been suggested by the more recent writers; malignant polyadenitis has recently been presented by Dr. Cantlie, of

London. This at least has the merit of indicating the local manifestation of the affection.

The first authentic description of the bubonic plague is contained in the writings of Rufus, of Ephesus, who described the disease as having existed in Northern Africa during the third or fourth century B. C., and presented the testimony of physicians of this period to corroborate his statements.

It is evident that Egypt was considered the home of the plague. During the reign of Justinian, in the year 542 A. D., the disease appeared in Egypt, and within a year extended to Constantinople, where it is said to have caused the death of 10,000 persons in one day. Within a short period it appeared in Italy and Gaul. It is fair to assume that the numerous "pestilences" which are referred to by Bede as occurring in England between the years 660 and 680 were epidemics of bubonic plague. Although the plague appeared in the centuries which followed the above dates, the next great outbreak which has been carefully described occurred in the fourteenth century, and was known as the "black plague" or "black death." It is hard to conceive of the terrible ravages caused by the plague during this time. It was brought from the East, and was supposed to have had its origin in China in 1334; thence it invaded India, Persia, Russia, and subsequently Poland, Germany, France, Italy, and Spain. It was believed by some writers of that day to have been introduced into Europe by the survivors of an expedition who landed at Genoa from the Crimea, a number of the party having died during the passage from a disease which was regarded as the plague. The disease appeared in Sicily in 1346; in England in 1349; and in Norway in 1351. Nearly the whole of Europe was invaded by this epidemic. In 1352 Oxford lost two-thirds of its academical population. It is estimated by Hecker that one-fourth of the population of Europe, or 25,000,000 persons, died of the plague during this reign of terror; 50,000 died in Paris; and out of 2,000,000 inhabitants in Norway but 300,000 survived. The same appalling results followed its appearance in London, Venice, and other cities of Europe. It was estimated by Pope Clement VI. that the mortality from the "black death" for the entire world was over 40,000,000. This outbreak lasted about twenty years. The plague again appeared in Europe during the fifteenth and sixteenth centuries. During the latter period (sixteenth century) China was almost depopulated. In 1656 the plague appeared in Naples, and in five months caused 300,000 deaths. During the same time the mortality in Rome was but 1400. This is of interest, inasmuch as the reduced mortality in the latter city was attributed to the sanitary precautions taken by Cardinal Gastaldi.

The great plague of London made its appearance in 1664, and lasted about one year. During this period there were 63,596 deaths

out of a population of 460,000. Hodges believed that the infection causing this outbreak was introduced by bales of merchandise from the Levant. The sanitary condition of London at this time was notoriously bad. It is a significant fact that those who lived out of town, on barges and ships in the river Thames, at this time, did not contract the disease. The outbreak was particularly destructive to the lower classes, and was known as the "Poor's Plague." Dr. George Thompson, a London physician, is said to have contracted the disease in the dissecting-room, although it is recorded that numerous post-mortems made during this period were without danger to the surgeon. No epidemic of plague appeared in London after 1666, although occasional cases were reported until 1679. In 1666 the disease invaded Cologne, and districts along the Rhine; and extended to the Netherlands in 1667–'69. It reappeared in France in 1720. In the period between 1675 and 1684 a new epidemic traversed the north of Africa and extended to Turkey, Poland, Hungary, Austria, and Germany, and then progressed northward. In 1679 there were 76,000 deaths in Vienna, and in 1681 Prague lost 83,000 of its population from the same cause.

During the eighteenth century the plague existed only in Eastern Europe, Asia, and Africa. Within this period it visited Constantinople several times with more or less disastrous effect. In 1720 a serious outbreak occurred in Marseilles and lasted until the end of 1721. It is estimated that it caused 46,000 deaths. The introduction of the disease into Marseilles was said to have been due to the arrival of a ship from Syria, where the disease prevailed. A severe epidemic occurred during the Russo-Turkish War in 1770 and in 1771. The Moscow epidemic was one of the most destructive of modern times; about 25 per cent. of the population of that city succumbed to the disease. During the end of the eighteenth and the beginning of the nineteenth century twenty-one outbreaks of the plague occurred in Egypt. Severe epidemics occurred in Constantinople during the early part of the present century. It appeared in Armenia a number of times between 1828 and 1843. The outbreaks which took place in Malta in 1813 and in Corfu in 1815 were probably due to the infection brought from the East. In 1828 an epidemic occurred in Greece, which is understood to have been introduced by troops coming from Egypt. With the exception of a slight outbreak in Dalmatia in 1840, and a severe one on the Volga, in the province of Astrakan in Russia, in 1878 and 1879, the disease has not again appeared on the continent of Europe, nor has it appeared in Egypt since 1845. Between 1853 and 1879 the plague appeared several times in Arabia, and in 1878 was within a short distance from Mecca. In 1858 a small outbreak occurred in Tripoli, at which place it reappeared in 1859 and 1873, but did not spread.

In 1867 the plague appeared in Mesopotamia (Irak) and prevailed

at intervals until 1885. A severe epidemic occurred in 1873 in this vicinity, and in 1874 it appeared further south at Divanieh. In 1876 it travelled northward and appeared at Bagdad; in 1877 it appeared at Shuster in Southwestern Persia, having been conveyed to this place by pilgrims returning from Irak.

In 1815 the plague appeared in India, showing itself in the provinces of Gujerat, Kattywar, and Cutch, "after three years of famine." During the next year it travelled to the northwest and broke out in Sind, and afterward extended in a southerly direction, but disappeared about 1820. However, it reappeared in 1836 in a severe epidemic at Pali in Marwar in Rajputana and lasted until the following year, 1837. Since then it has not appeared in this part of India.

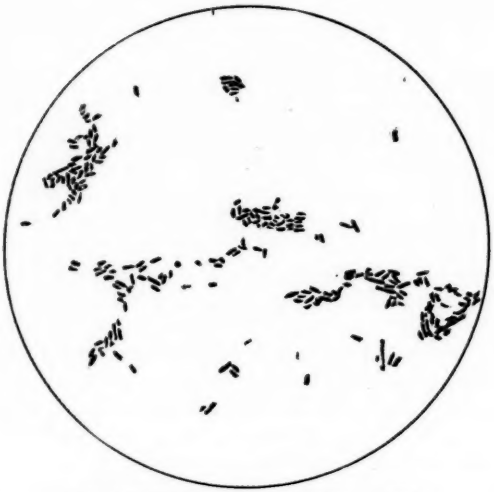
In 1823 the disease broke out southwest of the Himalayas, and other outbreaks occurred in this vicinity in 1834, 1836, 1849, 1850, and in 1852, and also in 1856 and 1877.

In China the plague has been endemic in the provinces of Pakhoi and Lienchu since 1871. From these localities it was transplanted to Canton and Hong-Kong in 1894. The mortality in the former place was 180,000. It was during this epidemic that the French physician Yersin and the Japanese physician Kitasato made their bacteriological researches, which constitute the only scientific information we possess regarding the bubonic plague.

Bacillus of the Bubonic Plague. The bacillus of the bubonic plague (*bacillus pestis bubonicæ*) was discovered and studied by Kitasato and Yersin, working independently at about the same time (1894), during the epidemic of the plague at Hong-Kong. It is found in large numbers in the pus from the buboes characteristic of this disease, in the lymphatic glands, and occasionally in the internal organs. It is apparently present in the blood only in acute hemorrhagic types of the disease and shortly before death. It has been isolated from these parts in human beings suffering from the disease; has been cultivated on artificial media; and a disease resembling it in all particulars has been produced in animals by inoculation with the cultures. Further, the organism has not been found in any other infectious disease, and it may be, therefore, fairly assumed that the bubonic plague is produced by this specific bacillus. It is pathogenic in many animals, and during epidemics rats, mice, and flies in large numbers become infected and die, and the disease is apparently transmitted through them. It has also been found in the feces, in the dust of infected houses, and in the soil.

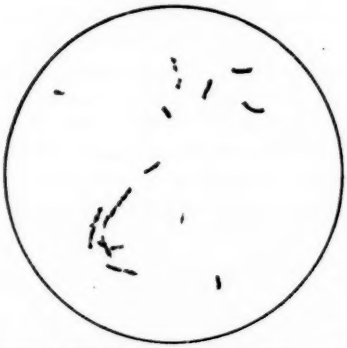
The bacillus occurs in the form of short, thick rods, rounded at the ends, somewhat motile, and occasionally in chains, often surrounded by a capsule. It stains well with the aniline-dyes, the ends being more deeply colored than the central portion. It does not form spores, and grows abundantly upon blood-serum at the body-temperature, the

FIG. 1.



Bubonic plague bacillus. Agar culture. × 1000.

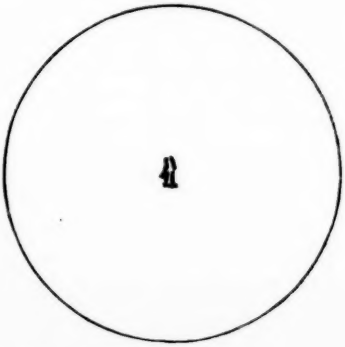
FIG. 2.



Bubonic plague bacillus. Bouillon culture. × 1000.

FIG. 3.

FIG. 4.



Bubonic plague bacillus. Bouillon culture. × 1000.

growth appearing on the surface after twenty-four to forty-eight hours, in the form of white, moist, transparent, and iridescent colonies. On gelatin it grows slowly along the track of the wire in stab-cultures, and on the surface of the medium at a temperature of 18° to 20° C. It grows rapidly on glycerin-agar, forming a grayish-white surface-growth. In bouillon a very characteristic appearance is produced, resembling that seen in cultures of the streptococcus of erysipelas—that is, the culture-medium appears clear with white granular or grumous deposits on the walls and in the bottom of the tube. This bacillus is pathogenic for rats, mice, guinea-pigs, and rabbits, which usually die within two or three days after inoculation. Then at the point of inoculation are found a somewhat hemorrhagic infiltration and œdema, with enlargement of the neighboring lymph-glands, hemorrhages into the peritoneal cavity, and congestion of the parenchymatous organs. The spleen sometimes shows minute nodules resembling miliary tubercles. Microscopically the bacilli are found in all the organs and in the blood. The disease is rapidly communicated from one animal to another, and thus its extension is facilitated.

The virulence of the bacilli in cultures and in nature seems to vary considerably, and is rather rapidly lost when grown on artificial media. The growth in cultures becomes more abundant after frequent transplantation. The virulence of the organism is increased by successive inoculation in certain animal species, and then its pathogenic properties for other species are less marked.

The Anti-plague Serum. Yersin, Calmette, and Borrell (*Annales de l'Institut Pasteur*, 1895) succeeded in immunizing animals against the bacillus of bubonic plague by the repeated intravenous or intraperitoneal injection of dead cultures or by subcutaneous inoculation. They also succeeded in immunizing a horse in about six weeks; so that the serum afforded protection to small animals after subcutaneous injection of virulent cultures, and even cured those which had been previously infected, if administered within twelve hours after the inoculation.

A more recent report (*Bull. de l'Acad. de Méd.*, 1896) shows that Yersin has successfully applied the same treatment to man for the cure of the plague.

The first case treated was a young Chinaman at the Catholic Mission at Canton, June 26, 1896, who was attacked with a severe type of the disease. He received three injections of the serum (10 c.cm. each) and recovered. The Consul-General of France at Canton telegraphed June 29th to the Minister of Foreign Affairs thus: "I have the honor to inform your excellency that Dr. Yersin has applied his serum to a Catholic Chinaman severely ill of the plague. Absolute success."

Dr. Monod, Director of Public Health in Paris, September, 1896, presented the following communication to the Academy of Medicine:

"After Dr. Yersin's departure from Canton the French Consul at Hong Kong, M. Chausse, performed the same operation upon two other pupils at the Mission who had the plague, and cured them. Having been informed that there were many cases of plague at Amoy, Dr. Yersin went thither on July 2d. He remained there ten days, during which time he treated twenty-two cases by subcutaneous injection of serum prepared in the Pasteur Institute in Paris, and cured twenty of them. If these statements are true, it may be accepted that the value of Dr. Yerson's serum is assured."

It is believed that the plague is transmitted solely through infection from previous cases. What part, if any, the soil plays in propagating the disease has not yet been settled. The natives of Eastern countries where the plague is prevalent are strongly impressed with the belief that the germ is contained in the ground. If this view is confirmed, it may in a measure explain why the infection of rats, etc., precedes or is present during an outbreak in the human being. The constancy with which this occurs deserves more than a passing notice. There is very little doubt that the bacillus discovered by Kitasato and Yersin is found in all cases of the disease in rats occurring during an epidemic of the plague. The rats are, as a rule, stricken before the inmates of the house are affected, and are frequently found dead in the different apartments. Their presence in the interior is regarded as a bad omen—a precursor of the disease. Dr. Cantlie discusses this matter in a very able article published in the London *Lancet* of January 9, 1897. Other animals, such as the pig and dog, are similarly affected, but not to the same extent as rats. Purely herbivorous animals are not attacked.

Exactly what influence climate and temperature have in the propagation of the plague, we do not know. We do know, however, that hot, dry air is fatal to the disease, and that moist, warm air is favorable to it. It even may be very active in cold weather; this was shown in the outbreak which occurred on the Volga in the severe winter of 1878. Like typhus fever, it is unknown in the tropics, and, like this disease, it usually selects its victims from the lowest class and thrives on filth and famine.

Incubation. From three to six days may be regarded as the period of incubation; the time rarely, if ever, extends beyond this. In malignant cases the disease may show itself within twenty-four hours after the exposure.

Symptoms. The bubonic plague may assume a mild character (pestes minor) and not seriously interfere with the daily occupation of the patient, and may continue over a period of two or three weeks or longer. A slight rise of temperature is noticeable, associated with a swelling of the glands, principally in the groin and armpit, which may or may not suppurate. Cases of this variety almost always recover. The course which this form runs is so mild that its identity with the typical form

of bubonic plague has been questioned. However, recent investigations have shown the identity of the two forms.

In the usual or severe form (pestes major) the early symptoms are similar to those which usher in typhus fever: the invasion being abrupt, associated with chills, great depression, blunted condition of the intellect, pains in the bones, high fever, etc. In rapidly fatal cases the glandular swellings may not occur. In the ordinary cases, however, they are almost always present, occurring principally in the groin and axilla, and occasionally in the neck and other regions. In some outbreaks carbuncles have been found in 2 or 3 per cent. of the cases; hemorrhages from the respiratory and alimentary tracts occur.

Hemorrhage from the respiratory or alimentary tract and petechial or hemorrhagic spots on the skin are looked upon as infallible signs of approaching death. The mortality varies in different epidemics, and is variously estimated at from 50 to 90 per cent. The disease, as it existed in Hong-Kong in 1894, when Yersin made his researches, is said by him to have presented all the symptoms and clinical features of the plague of the middle ages, and is thus described by him: "Onset abrupt; after an incubation of from four and one-half to six days, accompanied by weakness and prostration, the attack comes on suddenly with high fever, frequently attended by delirium. From the first day a specific bubo, unique in appearance, is observed in 75 per cent. of the cases in the groin, in 10 per cent. in the armpit, rarely on the neck or in other parts of the body. The lymph-glands rapidly enlarge to the size of a hen's egg. Death frequently occurs within forty-eight hours, and often earlier. When life is prolonged for five or six days the prognosis is more favorable: the bubo softens, and it may be operated on to allow the pus to escape. In some cases the bubo has not time to form; then hemorrhages take place into the mucous surfaces, or petechiæ appear on the skin. The mortality is enormous—95 per cent. in the hospitals."

It seems strange that a reappearance of the disease, which since the beginning of the Christian era has been so terribly destructive to human life, should be regarded with such apathy by the European powers as to allow it to gain its present headway in India. It is evident that the lesson taught by the ravages of previous epidemics has been unheeded. It is only within the past few weeks that any semblance of concerted action has been taken to stamp out the plague. What progress it may yet make in the East, or what probability exists of the disease reaching Europe overland, cannot be determined, and depends largely on the action of the sanitary authorities abroad. Of the numerous avenues by which the plague may reach Europe, the Suez Canal is one of the most important, and it is fortunate that the Egyptian government has a well-appointed sanitary station on this route; in fact, there are two, one at El Tor, on the southern coast of the Isthmus of Suez opposite and below

the town of Suez, and one at Suez, the entrance of the canal. At the former place provision is made for the reception of a large number of persons either sick or held for observation, with apparatus for disinfection by steam, etc. All vessels arriving at this place are inspected and detained if any evidence of infection is present. After release from this point the vessel is again examined at Suez, and, if found to be in good condition, is allowed to pass through the canal. The distance from Bombay or other Indian ports is so great that the longest possible period of incubation of the plague would be more than covered during the passage between these places. It is, therefore, evident that an infected person embarking at Bombay would develop the disease long before reaching El Tor. It is to be hoped that the present quarantine regulations of the Egyptian government will include the thorough disinfection of all ships, clothing of passengers, bedding, etc., which arrive from India, whether cases of illness have occurred on board or not. This would prevent the carrying of infected material to European ports, and, if effectively carried out, would render valuable aid in preventing the introduction of the plague into Europe by water.

The short period of incubation in this disease is also one of our great safeguards, as the time occupied in a passage to this country from a Mediterranean port would more than cover the period of incubation. This might also be said in regard to the passage from any European port. If an outbreak of this disease should occur on shipboard during the voyage, it would be made known to the quarantine officer on the arrival of the ship, which would be held for disinfection, the passengers and crew being treated as the occasion demands. There remains, however, an element of danger which unfortunately cannot very well be estimated, as our knowledge on this is meagre and unsatisfactory. I refer to the transmission of the disease by clothing, articles of merchandise, etc. It is this possibility which confronts the health officials, and constitutes a difficult and unpleasant problem. In view of the uncertainty which exists regarding the latter, it would seem imperative that every precaution should be taken to disinfect carefully and properly every piece of material which may be regarded as a menace to health.

With the improved and effective forms of apparatus for disinfection by heat which are now available, and the good results which are being obtained from the use of formaldehyd, no infected materials should gain entrance to this country, as no port of entry should be without the proper equipment for the treatment of possibly infected matter.

III.

ITS TREATMENT AND PREVENTION.

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Our modern knowledge of plague is due chiefly to the efforts and writings of Kitasato, Aoyama, Yersin, Wilm, Cantlie, Lowson, and Arnold.

Kitasato and Aoyama, with assistants, were commissioned by the Japanese Government to study the plague in Hong-Kong in 1894—Kitasato to make bacteriological investigation, and Aoyama to report upon the clinical and pathological characteristics of the plague.

Kitasato discovered the plague-bacillus, and first published the results of his investigations under the auspices of the University of Tokio, July 7, 1894. His report was reproduced in the *British Medical Journal*, and may also be found in full in the *Annual Report of the Marine-Hospital Service* for 1894.

Aoyama published his report in the *Mittheilungen aus der Medicinischen Facultat der Kaiserlich—Japanischen Universitat*, Tokio, June, 1895.

Yersin was commissioned by the French Minister for the Colonies to investigate the plague at Hong-Kong, and conducted his researches in 1894, both in Hong-Kong and Canton. The results were published in the *Annals of the Pasteur Institute*, September, 1894.

A second article in the *Annals of the Pasteur Institute*, July, 1895, was published jointly by Yersin, Calmette, and Borrel as the result of investigations in the laboratory of Roux in the Pasteur Institute. This article relates chiefly to the study of the toxins and the serum-therapy of the disease.

In January, 1896, Yersin, under the auspices of the French Government, returned to Annam (Cochin-China), and established there (at Nha Trang) a Pasteur Institute for the investigation of the disease.

In June, the same year, he proceeded to Canton, where he treated successfully a case of plague with serum brought from the Pasteur Institute at Nha Trang, this being the first case of plague subjected to the serum-therapy. He then proceeded to Amoy, where he treated twenty-three cases of plague, with twenty-one recoveries, with serum brought from the Pasteur Institute in Paris. The details of the above work are published in a third article by Yersin in the *Annals of the Pasteur Institute*, January 25, 1897.

Dr. Wilm, a surgeon of the German navy, was commissioned by his government to make an investigation of the pest in Hong-Kong during the epidemic in 1895, and made report thereon May 20, 1896.

Cantlie (lecturer on applied anatomy, Charing Cross Hospital Medical School, late of Hong-Kong) had opportunity for studying and recording the disease during the Hong-Kong epidemic, and a very complete lecture thereon is published in the London *Lancet* of January 2 and 9, 1897.

James A. Lowson, medical officer in charge of the Epidemic Hospital in Hong-Kong, has made a full report upon the epidemic of 1894, published by Noronha & Co., Government printers, Hong-Kong, 1895.

W. F. Arnold, Passed-Assistant Surgeon, U. S. Navy, studied the plague during its exacerbation in Hong-Kong in 1896. A preliminary report is published in the *Annual Report of the Surgeon-General of the U. S. Navy* for 1896. It is to this observer that we are indebted for the cultures which form the basis of the experiments now being conducted in three laboratories in the United States.

DEFINITION. Plague, or malignant polyadenitis, is an acute febrile disease, of an intensely fatal nature, characterized by inflammation of the lymphatic glands, marked cerebral and vascular disturbances, and by the presence of a specific bacillus. Although one gland alone may be clinically apparent, most, if not all, of the lymphatic glands are found to be enlarged at the post-mortem examinations. (Cantlie.)

PERIOD OF INCUBATION. Three to five days, possibly eight (Kitasato); four and one-half to six days (Yersin); two to seven days (Aoyama); three to six days (Cantlie); may reach nine days (Lowson).

Cantlie adds: "I do not think that we have evidence to place the period of incubation of malignant polyadenitis beyond the end of the sixth day after exposure. Be it observed, however, this extends only to plague-infection during an epidemic. The evidence to hand the last few weeks from Calcutta and from London renders the period of incubation of ambulatory plague uncertain."

SYMPTOMS AND DURATION OF THE DISEASE. "The patient complains of high fever and swelling of one or more of the lymphatic glands. These swellings may antedate, coincide with, or follow the rise in temperature, and are accompanied by severe pain. The most common gland affected is one of the femoral chain, next an inguinal, next axillary, and sometimes a cervical gland is affected. The tongue is coated with a grayish-white or dark-brown heavy fur. There is commonly headache, also delirium; the heart is generally affected; occasionally vomiting and diarrhœa are present (not frequently the last two conditions, which are generally forerunners of a fatal issue).

"In patients who survive the onset of the disease the temperature does not fall until a week has passed, and convalescence is a slow process.

"Sex and age make no difference in the disease; men and women, infants and old people, are attacked equally.

"If in such a case as described the blood be examined, the before-described bacilli, in greater or less numbers, will be found present.

"It is not always an easy matter to demonstrate the presence of the bacilli directly in the blood of many patients; they are present sometimes in such small numerical strength that only after examining several slides can they be discovered. In order to be safe, not only must the blood of a suspected plague-patient be examined, but a cultivation should also be made.

"In the buboes the bacilli always occur in the form of pure cultivations, but it is obviously not always easy to procure a specimen of bubo-contents from the living subject." (Kitasato.)

"When prodromal symptoms occur they generally last not more than two hours, and include lassitude, headache and malaise, vomiting, loss of appetite, dizziness, pain in the limbs, gland-swelling. The temperature soon reaches 39° or 40° C., or even higher, and continues high.

"Delirium occurs very early in the attack. It is seldom violent. The face is at first very red. Pulse strong, tense, and dicrotic. Urine dark red and frequently albuminous.

"The gland-affection occurs as the fever begins to rise; the swelling progresses rapidly, and in two days reaches the size of an egg. The pain is often so intense as to extort cries of anguish from the patient. At other times the swelling can only be detected by pressure, and is not painful. The swelling disperses or gathers in a huge collection of pus. Dispersion is slow, and often the swelling is perceptible for two months.

"The period of recovery begins usually with the end of the first or the beginning of the second week. Complications are numerous, namely, nephritis, abscesses, retention of urine, icterus, carbuncle, etc."

"Death usually occurs at the height of the disease, and between the second and eighth day. Intermissions in the fever do occur. (Lowson.) Death seldom occurs later than between the second and eighth day." (Aoyama.)

Yersin describes the course of the disease as follows: overwhelming prostration. The patient is suddenly seized with a high fever, accompanied by delirium. After the first day a bubo, usually single, appears. In 75 per cent. of the cases this bubo was in the groin, in 10 per cent. in the axilla—rarely in the neck or other regions. The gland affected quickly attains the size of a hen's egg. Death supervenes at the end of forty-eight hours, and frequently sooner. When life is prolonged for five or six days the prognosis is better. The gland then softens, and we may then operate and evacuate the pus. In many cases the bubo has not time to form, and then we have hemorrhages from the mucous membranes and petechial spots on the skin. The mortality is very large.

Wilm states that in one to five or six days after the fever begins the glands begin to swell. The duration of the fever is usually from a few hours to some weeks. In about 30 per cent. of the recorded cases the

fever of the infection lasted about five or six days, and this may be regarded as typical. It is high at the beginning and sinks slowly, with frequent returning remissions. It may last as long as ten days. After this primary fever a secondary fever occurs in a majority of recovering cases. This is the "fever of absorption," and may lead to weeks of exhausting illness, and cases may die at this stage which were saved in the battle of infection.

As to the swollen glands, Wilm says: even large buboes may form in a few hours after a time when a person has felt absolutely in the best of health. On the other hand, we frequently see a patient dying of plague without being able to feel a single affected gland, and only a thorough post-mortem examination shows the slightly swollen glands of lentil, pea, or almond size, which yield the plague-bacillus by microscope and culture-tube." 76 per cent. of Wilm's observed recorded cases died in the first six days. Death was generally caused by paralysis of the heart; in other cases it was from the brain-complication (meningitis, cerebritis, and hemorrhage). The temperature at death is sometimes very high; sometimes subnormal. Convalescence is generally prolonged and often complicated with suppurative fever.

Death-rate. (From official reports, Hong-Kong, 1894—Lowson.) Chinese, 93.4 per cent.; Indians, 77 per cent.; Japanese, 60 per cent.; Eurasians, 100 per cent.; Europeans, 18.2 per cent. Lowson adds: "No doubt the European blood and stamina had a good deal to do with the recovery—this, notwithstanding the more careful nursing they received. Early treatment and confidence in the European medical attendant were also in their favor."

Treatment. According to Tyson, free stimulation, nutritious food, together with cool baths to combat the fever, are the measures indicated. Antiseptic treatment of the abscesses should be practised, and may shorten the duration of these plagues of the skin as compared with the older treatment.

Kitasato's general directions relate to hygienic measures: proper receptacles for sewerage, purity of water-supply, isolation of the sick, disinfection of clothing and bedding and of the evacuations, all contact with the sick to be avoided, great care to be exercised with regard to food and drink, and after recovery the patient to be kept in isolation at least for a month.

Lowson advises: "Never use depressants if you can possibly do without them;" and states that brandy and tepid sponging were without doubt the best antipyretics.

The serum-therapy, as demonstrated by Yersin, is highly efficacious. Thirty cubic centimetres of the serum from an immunized horse cured the first severe case of plague upon which it was tried. Yersin in ten days, in Amoy, treated twenty-three cases of plague. Almost all of

them were treated in Chinese houses under bad sanitary conditions. His results were as follows:

Six plague-cases taken on the first day of the disease. Cure obtained in all in from twelve to twenty-four hours, without suppuration of the bubo, by injection of from 20 to 30 c.cm. of serum.

Six taken on second day. Cure slower; 30 to 50 c.cm. of serum used. Complete cure without suppuration in three or four days.

Four taken on third day. Fever persisted one or two days after commencement of injections. Cure was slower and in two cases the buboes suppurated; 40 to 60 c.cm. used.

Three taken on fourth day. Cured in five or six days. One bubo suppurated. Serum injected, 20 to 50 c.cm.

Four taken on fifth day. Two died whose cases were desperate from the outset. Serum used, 60 to 90 c.cm.

To the date of Yersin's report 26 plague-cases had been treated with serum—3 at Canton, 23 at Amoy. Of these only two died.

Varieties of the Disease. The preceding compilation relates to "malignant polyadenitis," which embraces both forms of plague known as "fulminant" and "typical."

According to Cantlie, the varieties of plague are (*a*) fulminant, (*b*) typical, (*c*) pestis minor, and they are all allied. He suggests that an appropriate name for the fulminant and typical plague is "malignant polyadenitis," and an appropriate name for the mild variety (pestis minor) "benignant polyadenitis." A benign polyadenitis, according to Cantlie, may run its course without being preceded or followed by the malignant variety, and the malignant polyadenitis may run its course without being preceded or followed by the benign variety, yet typical plague—malignant polyadenitis—is frequently associated with pestis minor—benign polyadenitis. A bacillus of somewhat similar appearance microscopically is reputed to be found in both. The cause of fulminant and typical plague is a diplo-bacterium in the blood and tissues. The cause of pestis minor, or benignant polyadenitis, may be an allied diplo-bacterium, but with less toxic power.

Pestis minor, until within a short time, according to Cantlie, was considered a disease of wholly different nature from that of true plague. Recently, however, news has been received from Calcutta of the discovery of a bacillus allied to the Kitasato bacillus of true plague, and associated with the variety of plague known as pestis minor. In this disease the temperature is rarely high, although it has been known to be 104° F. The duration is from ten to twenty days usually, but may be eight weeks, for most of which time the general health is but little impaired and the patient able to go about as usual. It may be observed here that the true relation of pestis minor to the true plague has not been satisfactorily determined. Cantlie concludes that a pestis ambulans

may become a malignant polyadenitis in the same person, even although the patient is removed from the infected zone, and that the period of incubation of ambulatory plague is uncertain. This is based upon the history of the case of a lad seventeen years of age, who had been exposed to plague in Bombay, and fifteen days before leaving Bombay for Calcutta had noticed swellings first in one groin and then in another, but never felt ill until his arrival in Calcutta. He was examined, and a diplo-bacterium identical with the Kitasato bacillus was found in his blood, and the clinical symptoms of plague were manifest. It is an unpleasant reflection that a person may be infected with plague fifteen or twenty days without feeling any inconvenience, but at the expiration of that time have the disease appear in its virulent form.

PLAGUE-BACILLUS. As the report of Kitasato published in English is readily available, and inasmuch as I have seen no translation of the article of Yersin, the limits of this paper preventing the observations of both writers, I insert here a translation of Yersin's description of the bacillus, taken from the *Annals of the Pasteur Institute*, September, 1894:

"The first indication was to see if a microbe existed in the blood and in the pulp of the buboes of those sick with the disease. The pulp of the buboes is filled in all cases with a veritable purée of a short, non-motile bacillus, with rounded ends, staining easily with the ordinary aniline-dyes, but not staining with Gram's method. The poles of the bacillus are stained more deeply than the centre, so that often a clear space is seen in the middle of the rod. Sometimes the bacillus appears to be surrounded by a capsule. It is found in great numbers in all the buboes and glands of patients. The blood also contains it sometimes, but in much smaller numbers; it is there only in very grave cases and those rapidly fatal.

"The pulp of the buboes planted upon gelatin gives rise to the development of white transparent colonies, presenting iridescent margins when viewed by reflected light. Culture is best made in glycerin-agar. The bacillus also grows upon coagulated blood-serum. In bouillon the growth presents a very characteristic appearance, quite similar to that of erysipelas—a clear liquid with grumous deposits along the walls and at the bottom of the tube. An alkaline solution of peptone, 2 per cent., with the addition of 1 to 2 per cent. of gelatin, is the most favorable medium. These cultures examined under the microscope show true chains of bacilli; sometimes presenting bulbous enlargements. Upon the gelatin, if we examine with great care and with a high magnification, we find among the normal forms bacilli sometimes deformed and sometimes chains formed of rods disposed laterally. These deformed and abnormal forms become more and more numerous in old cultures, and they stain but poorly."

According to Zettnor and Koch, as quoted in the London *Lancet*,

February 6th, the bacillus is a "bacillus asporigenus," which dies after four days, during which it is kept at a dry heat, or at the temperature of 80° C. for half an hour, or at that of 100° C. for a few minutes. Its resisting power to chemical disinfectants is feeble, succumbing shortly in a 1 per cent. solution of carbolic acid or of lime-water. On the other hand, it develops easily in many culture-media at the ordinary temperature (from 18° to 22° C.), having been found in the soil and in the dust of houses where those ill from it, or who have died from it, have been lodged.

DISINFECTION-EXPERIMENTS UPON THE BACILLUS OF BUBONIC PLAGUE.

	5 minutes.	10 minutes.	15 minutes.	30 minutes.
Formaldehyd:				
1 : 1000	No growth.	No growth.	No growth.	
1 : 2000	Growth.	Growth.	No growth.	
1 : 3000	Growth.	Growth.	Growth.	
Corrosive sublimate:				
1 : 1000	No growth.	No growth.	No growth.	
1 : 2000	No growth.	No growth.	No growth.	
1 : 3000	No growth.	No growth.	No growth.	
1 : 5000	Growth.	No growth.	No growth.	
1 : 10,000	. . . . .	No growth.	No growth.	
1 : 15,000	. . . . .	. . . . .	No growth.	No growth.
Lime:				
saturated solution	. . . . .	Growth.	No growth.	No growth.
Carbolic acid:				
0.25 per cent.	Growth.	Growth.	Growth.	
0.50 "	Growth.	Growth.	Growth.	
1.00 "	No growth.	No growth.	No growth.	
Trikresol:				
0.25 per cent.	No growth.	No growth.	No growth.	
0.50 "	No growth.	No growth.	No growth.	
1.00 "	No growth.	No growth.	No growth.	
Sulphur dioxide:				
1.25 per cent.	. . . . .	No growth.		
2.50 "	. . . . .	No growth.		
5.00 "	. . . . .	No growth.		
10.00 "	. . . . .	No growth.		

Thermal death-point between 58° and 60° C.

So far as known to the writer, experiments with the plague-bacillus are being conducted in but three laboratories in the United States, namely: Hoagland Laboratory in Brooklyn, the Laboratory of the Health Department of New York City, and the Laboratory of the Marine-Hospital Service in Washington. It may be said, in general, that the

investigations in these laboratories are confirmatory of the results of the investigations in the laboratories heretofore mentioned. A special investigation is being conducted, however, in the Hoagland Laboratory by Dr. E. H. Wilson, upon the life-history of the bacillus, and in a telegram received February 14th, in response to an inquiry, he informs me that the bacillus in a dark closet, on filter-paper and on wool-blanket, is still living at the end of the eighteenth day. The experiments conducted by Drs. J. J. Kinyoun and H. D. Geddings in the Laboratory of the Marine-Hospital Service have related especially to the action of disinfectants, the results of which are set forth in the preceding table.

The prescribed limits of this article prevent any considerations concerning the contagious and infectious character of the disease and the conditions which cause its spread. Neither is it possible herein to describe the measures which have been taken to prevent the spread of the disease in foreign countries and to prevent its introduction into the United States. These subjects would require a special treatise.

THE SERUM-TEST FOR THE DIAGNOSIS OF TYPHOID FEVER,

WITH A DESCRIPTION OF THE METHODS FOLLOWED AND THE RESULTS OBTAINED IN ITS USE IN THE LABORATORIES OF THE HEALTH DEPARTMENT OF NEW YORK CITY.

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AND
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As has been pointed out by Widal, the observations of Pfeiffer, Grüber, and Widal, showing that the blood-serum of persons ill with typhoid fever exercises a peculiar influence upon recent broth-cultures of the typhoid bacillus, introduce an entirely new phase in the practical application of bacteriological work in the study of the infectious diseases.

Hitherto bacteriological investigations, in their clinical application, have been confined solely to the demonstration of pathogenic microorganisms, either by culture or by direct microscopical examination in the tissues, fluids, or secretions of the body. These new observations have disclosed a method which permits of the diagnosis of typhoid fever by the peculiar reaction occurring in broth-cultures of the typhoid bacillus when the blood-serum of a typhoid patient is added.

The development of our present knowledge of the subject may be briefly traced as follows:

As long ago as 1892 Grüber described an agglomeration of the bacilli as occurring in guinea-pigs which had died after cholera-infection; but to Pfeiffer is undoubtedly due the credit of having observed and fully described the peculiar influence of the respective serums of immunized animals on the cholera-vibrion and the typhoid bacillus when added to broth-cultures of these organisms and the mixtures then introduced into the peritoneal cavity of other animals.

In various communications published in 1894 and 1895 Pfeiffer showed that when cultures containing dead or living cholera-spirilla or typhoid bacilli are injected subcutaneously into animals or man specific protective substances are formed in the blood of the individuals thus treated. These substances grant a more or less complete immunity against the invasion of the living germs of the respective diseases. He also described the occurrence of a peculiar phenomenon when a portion of a fresh culture of the cholera-vibrion on agar is added to a small quantity of the serum of an animal immunized against cholera, and the mixture injected into the peritoneal cavity of a non-immunized guinea-pig. After this procedure, if from time to time minute drops of the liquid be withdrawn in capillary tubes and examined microscopically, it is found that the vibrions, which were formerly, and in control-animals which remain, actively motile, become in a very short time, under the influence of the serum, entirely motionless and later dead. They are first immobilized, then they become somewhat swollen and agglomerated into balls or clumps, which gradually become paler and paler, until finally they are dissolved in the peritoneal fluid. This process takes place regularly, in about twenty minutes, provided a sufficient degree of immunity be present in the animals from which the serum was obtained.

The animals injected with the mixture containing cholera-cultures and the serum of immunized animals remain unaffected, while control-animals treated with a fluid containing only the serum of non-immunized animals mixed with cultures of the cholera-vibrion promptly die.

Pfeiffer claimed that the reaction of the serum employed in this manner is so distinctly specific that it may serve for the differential diagnosis of the cholera-vibrion from other vibrions. If a mixture of the cultures of two vibrions is used in this experiment, only that species is destroyed which has been employed to immunize the animal whose serum is introduced with the cultures. These latter observations of Pfeiffer were made before 1894, and were demonstrated to one of the writers early in 1894 in the Institute for Infectious Diseases in Berlin.

In March, 1896, Pfeiffer and Kolle published an article in the *Deutsche med. Wochenschrift*, entitled "The Differential Diagnosis of Typhoid Fever by Means of the Serum of Animals Immunized against Typhoid Infection." In this communication the authors say that by the aid of the serum of convalescents from typhoid fever, or of animals immunized

against typhoid infection, typhoid bacilli can be differentiated from the bacillus coli communis and from other bacteria resembling the typhoid bacillus. This is accomplished by mixing the serum with cultures of the typhoid bacillus and introducing the mixture into the peritoneal cavity of guinea-pigs. A specific reaction appears, which can be followed microscopically. Agglomeration and agglutination of the bacilli occur, followed by deformity and final solution. The animals remain unaffected. The bacteria belonging to the coli group, and all other similar bacteria, are not influenced in this test when the serum of animals immunized to the typhoid bacillus is employed. "This change takes place only with the typhoid bacilli, and is a specific reaction due to the bactericidal reaction of the typhoid serum."

It was further found, if the serum from a goat, which had been immunized (so that its immunity was about ten times as great as that of the average convalescent from typhoid fever), was diluted with forty parts of bouillon, and a similar dilution made of the serum of non-immunized animals, and both solutions were then inoculated with a culture of the typhoid bacillus and placed in an incubator at 37° C., that after the expiration of one hour macroscopical differences in the culture could be observed, which increased in distinctness for four hours and then gradually disappeared. The reaction occurring may be described as follows: in the tube in which the typhoid culture is mixed with typhoid serum the bacilli are agglomerated in fine whitish flakes, which settle to the bottom of the tube, while the supernatant fluid is clear or only slightly cloudy. On the other hand, the tubes containing mixtures of bouillon with the cholera-serum, or the serum from non-immunized animals inoculated with the typhoid bacillus, became and remained uniformly and intensely cloudy. These two serum-mixtures, examined microscopically in a hanging drop, also show distinct differences. The typhoid serum mixture inoculated with the typhoid bacilli exhibits the organisms entirely motionless, lying clumped together in heaps; in the other mixture the bacilli are actively motile.

Pfeiffer and Kolle say further: "No such differences were shown when bacteria of the coli group were examined after mixture with the typhoid serum." They conclude: "It would seem, therefore, that this method, which is simple of execution in any laboratory, may be of great practical value as an aid to differential diagnosis."

Grüber, in an article in the *Wiener med. Wochenschrift* for March, 1896, describes some investigations conducted in conjunction with Dr. Herbert E. Durham, of London. He criticises Pfeiffer's conclusions and attempts to show by a series of experiments that the reaction described by Pfeiffer is by no means specific, and that when the reaction is positive the diagnosis still remains in doubt, for the reaction is *quan-*

titative only, and not *qualitative*, so far as the cholera-vibrion is concerned. Grüber expresses the opinion, however, that it is of greater service with regard to the typhoid bacillus, and concludes that these investigations will render great assistance in the clinical diagnosis of cholera and typhoid fever. He describes a method for applying the test in regard to both of these organisms, which closely resembles that of Pfeiffer's.

Durham published a paper in the *British Medical Journal* of March 19, 1896, on "The Special Reaction of the Serum of Highly Immunized Animals, and the Use of this Serum for Diagnostic and Other Purposes." He describes in considerable detail the use of these serums, and draws a series of conclusions as to the value of the reactions.

The first practical application of this method for the diagnosis of typhoid fever on a more extensive scale was made by Widal and reported with great fulness and detail in a communication published in June, 1896, in *La Semaine Méd.*

Widal describes the phenomenon as follows: "Several bouillon-tubes are separately inoculated with the typhoid bacillus and the bacillus coli communis. A few drops of the serum of an animal thoroughly immunized against typhoid infection are added to each of these, and they are then placed in an incubator at 37° C. In four or five hours the tubes containing the bacillus coli communis begin to become cloudy, while the tubes inoculated with the typhoid bacillus remain almost entirely clear. At the end of twenty-four hours the tubes with the bacillus coli have become intensely cloudy throughout, while those containing the typhoid bacillus remain clear or are but slightly cloudy, the microbes in these tubes having been precipitated as whitish flakes to the bottom.

"A drop of the culture of the bacillus coli examined microscopically shows isolated bacteria, for the most part actively motile. A drop of the culture of the typhoid bacillus, on the other hand, when examined microscopically, presents only scattered agglomerations of bacteria which are immobile, deformed, thickened, and agglutinated together. No isolated or motile bacteria are to be seen. The formation of a precipitate visible to the naked eye, and, microscopically, the immobilization, agglutination, and deformity of the microbes are the characteristics of the phenomenon.

"The serum of an animal thoroughly immunized to the typhoid bacillus is more active than that of a patient suffering with or convalescing from typhoid fever. The greater the immunization to which the animal has been subjected the more active is the serum.

"By the use of this test," Widal continues, "I have examined the serum obtained from some six typhoid fever patients on the seventh, twelfth, fifteenth, sixteenth, nineteenth, and twenty-first days of the disease, to determine whether it could be employed for the clinical diagnosis of

typhoid fever. Each time I readily obtained undoubted evidences that the serum exerted an immobilizing and agglutinating action on the bacilli in cultures of the typhoid organism."

The method employed in this investigation was as follows: a small quantity of blood having been withdrawn, under aseptic precautions, with a sterilized syringe from a vein at the elbow, the serum, after coagulation of the blood, is decanted and a few drops introduced into a tube containing a broth-culture of the typhoid bacillus, the proportion being one part of serum to ten or fifteen parts of broth. The tube is then placed in an incubator at a temperature of 37° C. After twenty-four hours, when the typhoid serum has been employed, the characteristic reaction as described is apparent to the naked eye, and is seen microscopically in the hanging drop.

The peculiar appearance of the culture is still evident after two, three, or four days, but at the end of the first twenty-four hours the precipitate seems to be most abundant.

"This phenomenon may be observed in a simpler manner," Widal says, "by withdrawing several drops of blood from the end of the finger, under aseptic precautions, and after the blood has clotted the serum is separated and added drop by drop to a broth-culture, in the proportion of one to ten. If the serum has been obtained from a case of typhoid fever, a characteristic reaction will be immediately observed.

"When the blood-serum of patients in good health, or of those suffering from other diseases than typhoid fever, is subjected to this test, few or none of the appearances observed in the above reaction are seen. The reaction may be found for considerable periods after recovery from typhoid fever."

In subsequent communications Widal reports further observations. In one of these communications he refers to the resistance of the agglutinating property of the serum, and notes that the dried serum and the dried blood as well, to a less extent, retain the specific action.

Achard has shown that exposure to diffused sunlight, extending over a period of weeks, produces no change in the agglutinating property of the blood or serum. He also found that various fluids and secretions of typhoid patients possessed the same property in a greater or less degree. The serous fluid of blisters, the serum from pus, tears, and urine of typhoid patients; the milk of a wetnurse sick with typhoid fever, and other fluids possess this property. It was found that in the inflammatory exudations of serous membranes occurring during typhoid fever this property was present when the exudate did not occur too rapidly.

Achard also found the same to be true with regard to the secretion of the lachrymal glands. If the secretion was taken with a pipette from the inner canthus of the eye, it gave a marked reaction; but if the secre-

tion was markedly increased by inhaling ammonia vapor, the rapidly flowing tears did not give the reaction.

Achard and Bensaude found that the milk of a wetnurse suffering from typhoid fever, which gave a reaction, lost this property when the milk was not pure and freshly drawn. They also found that prolonged exposure to a temperature of 60° C. did not affect the reaction; but that it was considerably diminished at 100° C., and was lost after boiling the milk for fifteen minutes at 120° C. It also disappeared after filtration through a porcelain tube, and the same was found to be the case with urine. The blood-serum of a sucking-infant, fed with milk which showed the reaction, did not possess it.

Widal and Achard attempted to ascertain what substances in the blood possess the agglutinating power. They found that blood-serum deprived of globulin had lost the agglutinating property, while the globulin retained it. They found also that when globulin and fibrin have been separated from the blood and dissolved, that each one of these substances possesses intense agglutinating power; while the plasma deprived of these, and containing only albumin, has lost its specific action. The same has been found to be true of the serous fluid of blisters and the serous fluid of the pericardium, peritoneum, etc. It would appear, therefore, that the agglutinating property belongs to the fibrin and the globulin of the blood. Similar results were noted in relation to the albumin and globulin of milk. Casein isolated and dissolved preserves powerful agglutinating properties.

The observations of Widal and others would seem to show that this peculiar phenomenon is not a reaction of immunization, but is "an infection-reaction," becoming less pronounced and sometimes disappearing during convalescence; that is, diminished at the time when immunity is most marked. In some cases it has not been found on one day, and has appeared on the next; or it is present in marked form on one day, and has disappeared on the next. In the majority of cases it diminishes in intensity soon after convalescence is established and frequently soon disappears; while in other persons it remains fairly distinct, even for some years after recovery. The serum does not actually destroy all the bacteria, as is shown by the fact that cultures still retain their power of growth after transplantation, even when mixed with active typhoid serum in equal parts and allowed to remain for long periods exposed to its action.

All observers have agreed in confirming the observations of Pfeiffer, Grüber, and Widal as to the occurrence of this peculiar phenomenon in most cases of typhoid fever at some period in the course of the disease; but in some instances it appeared on the fourth or fifth day, in others not until the end of the third week or later, and rarely not at all.

TABLE

giving the results of the method of sero-diagnosis in cases of clinically typical or suspected typhoid fever, in convalescents or those who have had typhoid, in diseases other than typhoid, and in healthy subjects, showing the number of cases tested, the period when the test was made, and the reaction.

Reporter.	Number of cases of typical or suspected typhoid tested.	Day of disease when tested.	Reaction.				Number of convalescents tested.			Number of cases other than typhoid tested.		Number of healthy subjects tested.		Test used.
			Positive.		Negative.		Reaction.		Period when tested after convalescence.	Reaction.		Reaction.		
			Decisive.	Partial or feeble.	Decisive or confirmed.	Typhoid fever; no reaction.	Positive.	Negative.		Positive.	Negative.	Positive.	Negative.	
Widal,	80	4th to 21st day.	45	.....	35	.....	6	16	1½ to 9 years.	0	200	0	39	Fluid serum.
Achard,	9	7th to 12th day.	3	.....	3	3	.....	.....	.....	.....	.....	.....	.....	" "
Dieulafoy,	2	7th to 12th day.	2	.....	.....	.....	.....	.....	.....	.....	No. not stated.	.....	.....	" "
Chantemesse,	11	9th day.	11	.....	.....	.....	.....	.....	.....	0	10	.....	.....	" "
Rendu,	1	11th day.	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	" "
Haushalter,	39	7th to 12th day.	27	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	" "
Vedel,	2	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	" "
Courmont,	13	.....	11	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	" "
Gatrin,	57	4th to 41st day.	36	.....	21	.....	.....	.....	.....	0	20	.....	.....	" "
Theolen and Mills,	12	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	" "
Grünbaum,	8	10th to 33d day.	8	.....	.....	.....	6	0	4 to 37 years.	15[1]	4	4[1]	3	" "
Durham,	4	8th to 21st day.	2	.....	.....	2	4	3	10 dys. to 6 wks.	.....	.....	.....	.....	" "
Delépine,	30	8th to 23d day.	24	1	4	1	.....	.....	.....	0	10	.....	.....	" " and dried blood.
Greene,	11	16th to 38th day.	11	.....	.....	.....	.....	.....	.....	0	14	.....	.....	Fluid serum.
Johnston,	143	48 hrs. to 3d wk.	118	5	14	6	16	1	.....	0	35	.....	.....	Dried blood.
Total,	422	2d dy. to 4th wk.	312	6	92	12	32	20	.....	15	293	4	42	

[1] The positive reactions obtained by Grünbaum in cases, other than typhoid and in healthy subjects, occurred only when the serum was used in greater concentration than 1 to 10. In mixtures of 1 to 10 the reaction occurred only in typhoid fever.

The table on page 280, prepared by Dr. Arthur R. Guerard, Assistant Bacteriologist to the Health Department, shows, as well as is possible in tabular form, the results reported by various observers up to January 1, 1897, in the use of the serum-test for the diagnosis of typhoid fever.

In a total of 422 cases of typical or suspected typhoid fever, reported by fifteen different observers, 404 were diagnosticated decisively to be typhoid fever or not, 312 positively and 92 negatively; or in about 95 per cent. of cases the diagnosis was confirmed by the serum-test on the first examination; 6 of the positive reactions were partial or feeble at first, but on re-examination were decisive. 12 of the negative reactions were doubtful or remained indecisive.

In a total of 63 cases who had had typhoid fever, 32 gave the reaction and 30 did not. In 308 cases of diseases other than typhoid there was no reaction with the blood or serum in a dilution of 1 part of serum to 9 of the culture, but when the dilution of serum was less than 1 to 9 a reaction frequently occurred. Of 46 healthy subjects examined, 4 gave the reaction, or about 10 per cent.; but many persons, the number of which is not stated in the reports, were examined and gave no reaction with the typhoid cultures; therefore these data are incomplete.

The Use of the Serum-test in the Laboratories of the New York Health Department.

Wyatt Johnston, of Montreal, introduced the use of this method in municipal laboratories for the diagnosis of typhoid fever, suggesting that dried blood should be employed in place of blood-serum. Widal had shown that drying did not destroy the agglutinating properties of typhoid blood. In September and October, 1896, some investigations on this subject were begun in the laboratories of the Health Department of New York City, and in the latter part of October the Health Board issued an announcement to the physicians of this city, from which the following extracts are made:

"Observations on the blood-test for the diagnosis of typhoid fever, which have been in progress in the laboratories of the New York Health Department for some time past, have thus far confirmed the conclusions of previous investigators, and it seems probable that we have in this method not only a rapid, but also a reliable diagnostic test. Comparatively few cases, however, have as yet been examined very early in the course of the disease, and it is not positively known how early the reaction ordinarily appears.

"The Health Department therefore requests that physicians having cases which present symptoms suggestive of typhoid fever send specimens of the blood daily, or every other day, until the nature of the disease shall clinically be clearly defined.

"One source of error which must be guarded against arises from the persistence of the reaction in some cases for a number of years after an attack of typhoid fever, so that a reaction may appear in health, or in affections other than typhoid fever, if the individual have previously suffered from the latter disease.

"It must be distinctly understood that the observations thus far made are not sufficiently numerous and complete to permit a positive conclusion as to the exact value or the limitations of this test, and it is the desire of the Health Department to supply as soon as possible the data necessary to such conclusion.

"When a negative result is reported in a suspicious case the physician in attendance is particularly requested to send further specimens, and in every case to notify the Director of the Laboratory as to whether the laboratory diagnosis is finally in harmony with the clinical diagnosis or is at variance with it. In the cases in which the reaction is decided it may apparently be stated positively that the patient either has, or has had within a few years, typhoid fever. In those cases in which the reaction is present, but not well marked, only a probable diagnosis can be made. The complete absence of the reaction in the blood of a patient sick more than one week (if further examinations confirm the results thus far obtained) will justify the exclusion of the diagnosis of typhoid fever.

"DIRECTIONS FOR PREPARING THE SPECIMENS OF BLOOD. The skin covering the tip of the finger is thoroughly cleansed and is then pricked with a clean needle deeply enough to cause several drops of blood to exude. Two drops are then placed on the accompanying glass slide, one near either end. After drying, the slide is placed in the holder and returned to the station from which it was obtained or mailed to the laboratory. Full data of the case must be forwarded with each specimen. A report of the result of the examination will be mailed to the attending physician on the following day."

Arrangements were at once made so that physicians could obtain glass slides for collecting blood, with slide-holders, circulars of information, and the accompanying blanks to be filled out, from the various health department depots (nearly one hundred in number) scattered through the city. After preparation of the specimens they are returned to one of the depots and are collected by employés of the health department each afternoon, with the specimens of sputum for the diagnosis of tuberculosis and culture-tubes for the diagnosis of diphtheria. Copies of the blanks follow:

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BLANK. FIRST SPECIMEN.

Typhoid Fever.

Date..... *Time*.....

Name of Patient..... *Age*.....

Address..... *Occ*.....

Attending Physician.....

Address.....

Clinical Diagnosis.....

Duration of Illness.....

Has Patient previously had Typhoid Fever?.....

If so, how long ago?.....

If Typhoid Fever, where contracted?.....

Has Patient been outside of New York City during the month previous to present illness?.....

If so, where?.....

☞ See other side for directions for preparing specimens and for temperature-record.

This blank should be filled out in full by attending physician.

BLANK. FIRST SPECIMEN (REVERSE SIDE).

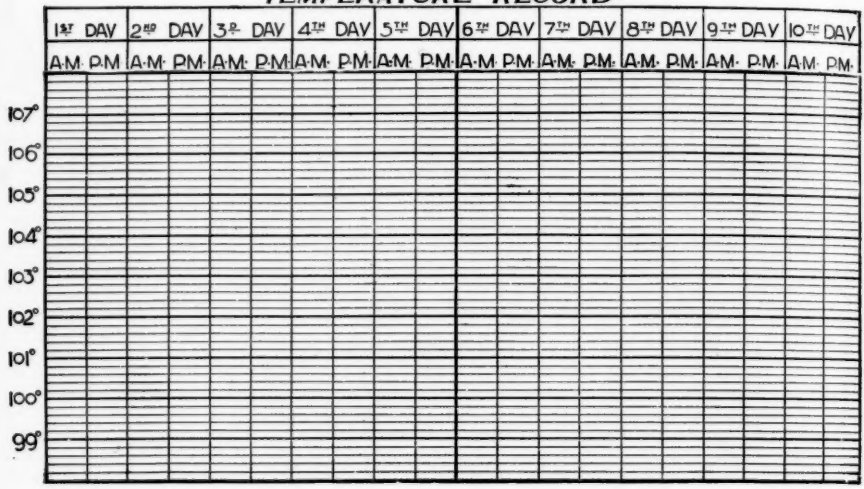
Directions for Preparing Specimens of Blood.

The skin covering the tip of the finger is thoroughly cleansed and is then pricked with a clean needle deeply enough to cause several drops of blood to exude. Two drops are then placed on the accompanying glass slide, one near either end. After drying, the slide is placed in the holder and returned to a culture-station, or mailed to the laboratory. The accompanying blank must be fully filled out and forwarded with the specimen. A report of the result of the examination will be mailed to the attending physician on the following day.

Communications should be addressed to

HERMANN M. BIGGS, M.D.,
Pathologist and Director of the Bacteriological Laboratories,
Criminal Court Building, New York City.

TEMPERATURE RECORD.



89 L—1896.

BLANK. LATER SPECIMEN.

Typhoid Fever. Later Specimens.

No. of Specimen: 2*d*, 3*d*, 4*th*, 5*th*, 6*th*, 7*th*, 8*th*.

Date ..... *Time* .....

Name of Patient ..... *Laboratory No.* .....

Address .....

Attending Physician .....

Address .....

Duration of Illness .....

Clinical Data noted since Previous Specimen was taken:

.....

.....

.....

.....

☞ See other side for directions for preparing specimens and for temperature-record.

This blank should be filled out in full by attending physician.

BLANK. LATER SPECIMEN (REVERSE SIDE).

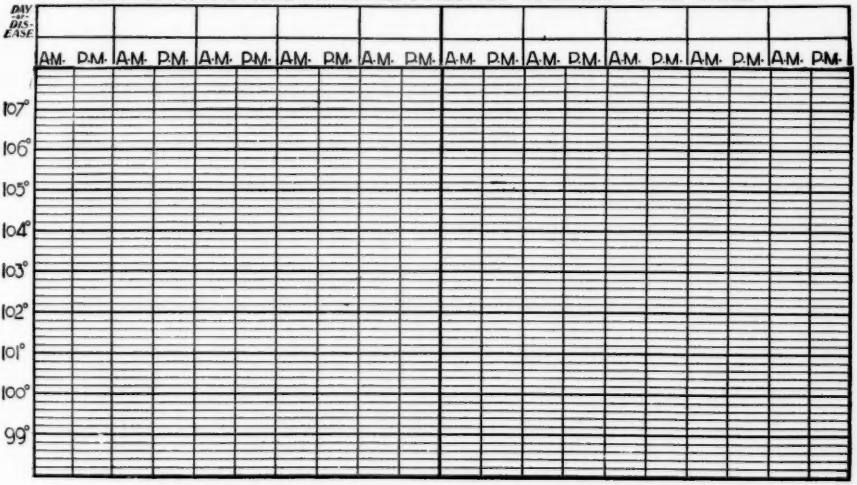
Directions for Preparing Specimens of Blood.

The skin covering the tip of the finger is thoroughly cleansed, and is then pricked with a clean needle deeply enough to cause several drops of blood to exude. Two drops are then placed on the accompanying glass slide, one near either end. After drying, the slide is placed in the holder and returned to a culture-station, or mailed to the laboratory. The accompanying blank must be fully filled out and forwarded with the specimen. A report of the result of the examination will be mailed to the attending physician on the following day.

Communications should be addressed to

HERMANN M. BIGGS, M.D.,
Pathologist and Director of the Bacteriological Laboratories,
Criminal Court Building, New York City.

TEMPERATURE RECORD SINCE PREVIOUS SPECIMEN WAS TAKEN.



The facilities thus offered to the physicians of New York City for determining the value of the serum-test for the diagnosis of typhoid fever have been quite largely utilized, and a full description of the results obtained is given below.

In a majority of the tests made in the Health Department laboratories specimens of dried blood have been used; in a small number only the serum from coagulated blood or blisters.

Ordinarily the reaction has been watched under the microscope in the hanging drop. The influence of the serum upon larger quantities of partially or completely developed broth-cultures has only been observed

in a moderate number of cases for the purpose of comparing the results with the routine method.

Technique of Obtaining Serum and Dried Blood. Blood may be easily obtained by pricking the tip of the finger or the ear. Two or three large drops should be collected on a glass slide and allowed to dry. Paper is not as good a receiver for the blood as glass, for the blood soaks more or less into it, and later, when it is dissolved, some of the paper-fibre is apt to be rubbed off with it.

In preparing the specimen for examination the dried blood is brought into solution by mixing it with about five times the quantity of water. Then a drop of this decidedly reddish mixture is placed on a cover-glass and to it is added a drop of a fifteen- to twenty-hour bouillon-culture of the typhoid bacillus. The two drops, after being mixed, should have a faint reddish tinge. The cover-glass, with the mixture on the surface, is inverted over a hollow slide (the edges about the concavity having been smeared with oil or fluid vaseline so as to make a closed chamber, and the hanging drop then examined under the microscope (preferably by gaslight), a high-power dry lens (about $\frac{1}{8}$ inch) being used.

If the reaction takes place rapidly, the first glance through the microscope reveals the completed reaction, all the bacilli being in loose clumps and nearly or altogether motionless. Between the clumps are clear spaces containing few or no isolated bacilli.

If the reaction is a little less complete, a few bacilli may be found moving slowly between the clumps, in an aimless way, while others attached to the clumps by one end are apparently trying to pull away, much as a fly caught on fly-paper struggles for freedom.

If the agglutinating substances are still less abundant, the reaction may be watched through the whole course of its development. Immediately after mixing the blood and culture together it will be noticed that many of the bacilli move more slowly than before the addition of the serum. Some of these soon cease all progressive movement, and it will be seen that they are gathering together in small groups of two or more, the individual bacilli being still somewhat separated from each other. Gradually they close up the spaces between them, and clumps are formed. According to the completeness of the reaction, either all the bacilli may finally become clumped and immobilized or only a small portion of them, the rest remaining freely motile, and even those clumped may appear to be struggling for freedom. With blood containing a large amount of the agglutinating substances all gradations in the intensity of the reaction may be observed, from those shown in a marked and immediate reaction to those appearing in a late and indefinite one, by simply varying the proportion of blood added to the culture-fluid.

Pseudo-reactions with Dried Blood. If too concentrated a solution of dried blood from a healthy person is employed, there will be an

immobilization of the bacilli, but no true clumping. This is sometimes mistaken for a reaction. Again, dissolved blood always shows a varying amount of detritus, partly in the form of fibrinous clumps, and prolonged microscopical examination of the mixture of dissolved blood with a culture-fluid shows that the bacilli often become more or less entangled in these clumps, and in the course of one-half to one hour very few isolated motile bacteria are seen. The fibrinous clumps, especially if examined with a poor light, may be very easily mistaken for clumps of bacilli. This pseudo-reaction is regarded by many inexperienced observers as a true typhoid reaction, but it occurs as readily with non-typhoid as with typhoid blood.

The Use of Serum Obtained from Blisters or the Blood. Fluid serum can be easily obtained in two ways: 1st. The serum may be obtained directly from the blood thus: the tip of the finger or ear is pricked with a lancet-shaped needle, and the blood as it issues is allowed to fill by gravity a capillary tube having a central bulb. The ends of the tube are then sealed by heat or wax, and as the blood clots a few drops of serum separate. This method of obtaining blood-serum has the advantage of rapidity; but also this disadvantage, namely, that the serum thus separated is apt to contain more or less blood-cells, which somewhat obscure the field when the liquid serum is immediately mixed with the culture, and which cause clumps of detritus (resembling, though less marked, those found with the dried blood), if the serum is allowed to dry. 2d. The serum may be obtained from a blister. In the examinations thus far made this has given far more satisfactory results. The method is as follows: a piece of cantharides-plaster the size of a five-cent piece is applied to the skin at some spot on the chest or abdomen. A blister forms in from six to eighteen hours. This should be protected from injury by a vaccine shield or bunion plaster. The serum from the blister is collected in a capillary tube, the ends of which are then sealed. Several drops of the serum can be easily obtained from a blister so small that it is practically painless and harmless. The serum obtained is clear and admirably suited for the test.

The Advantages and Disadvantages of Serum and Dried Blood for the Serum-test. The dried blood is easily and quickly obtained and does not deteriorate or become contaminated by bacterial growth. It is readily transported, and seems to be of nearly equal strength with the serum in its agglutinating properties. It must, however, in use, be diluted with at least five times its bulk of water, otherwise it is too viscid to be properly employed. The amount of dilution can only be determined roughly by the color of the resulting mixture, for it is impossible to estimate accurately the amount of dried blood from the size of the drop.

Serum, on the other hand, can be used in any dilution desired, varying

from a mixture which contains equal parts of serum and broth-culture to that containing 1 part of serum to 100 parts of culture. It can be measured roughly by the platinum loop, or more carefully by a graduated capillary pipette. The disadvantages in the use of serum are entirely due to the slight difficulty in collecting and transporting it, and the delay in obtaining it when a blister is employed. If the serum is obtained from blood after clotting has occurred, a greater quantity of blood must be drawn than is necessary when the dried blood method is used. If it is obtained from a blister, a delay of eight to eighteen hours is required. The transportation of the serum in capillary tubes presents no difficulties if tubes of sufficiently thick and tough glass are employed and a proper case supplied.

The Typhoid Culture Employed. The majority of tests have been made with an eighteen, to twenty-hour broth-culture of a typhoid bacillus which was received from Pfeiffer during the past summer. Its virulence is such that one-fifth of a milligramme of a fresh agar-culture injected into the peritoneal cavity of a guinea-pig kills it in thirty-six to seventy-two hours.

Two other cultures of about one-half the virulence of the Pfeiffer culture have also frequently been used, and occasionally some one of a half-dozen other cultures whose virulence has not been tested. These latter include the culture used by Wyatt Johnston, which was kindly furnished to us. All these cultures gave fair reactions; some seemed to give more typical clumping than others, and the Pfeiffer culture particularly gave the most characteristic reactions. We have by chance used the method, adopted by Johnston, of planting our broth-cultures from old-stock cultures, but have not found it possible to avoid by this method moderate or pseudo-reactions in some cases not having typhoid fever. It seems to us that the main requirement is to have a broth-culture not over twenty-four hours old, in which the bacilli are isolated and actively motile, and the degree of whose motility is known.

The Dilution of the Blood or Serum to be employed and the Time required for the Development of the Reaction. The serum-test, as shown by Widal, Grünbaum, and others, is quantitative and not qualitative. By this it is not meant to assert that the agglutinating and immobilizing substances produced in the blood of a typhoid patient are the same as those present at times in normal blood or those produced in the blood of persons sick with other diseases. It is intended, however, to maintain that the effect upon the bacilli as observed under the microscope is identical; the difference being that in typhoid fever, as a rule, the reaction occurs after the addition to the culture of far smaller quantities of serum than in other diseases, or when the same dilution is used it occurs far more quickly and completely with the typhoid serum. That the test is quantitative and not quali-

tative is well shown by the results of the examination of the seven following consecutive cases from Bellevue Hospital. Four of the cases were ultimately proved not to have been typhoid fever.

Case.	History, symptoms, and diagnosis at time of taking blood-specimens.	Corrected diagnosis on completion of illness.	Reaction of bacilli in broth-cultures to serum in different dilutions.		Reaction.
			Amount of serum.	Amount broth-culture	
1	Adult; sick four weeks, continuous high fever; pleurisy; "tuberculosis" with possibility of typhoid.	Tuberculosis.	1	1	Not appreciable.
2	Boy; sick two weeks; continued moderate fever, abating when test was made; prostration, constipation; no typhoid symptoms except fever and prostration; "atypical typhoid fever."	Uncertain.	1	1	Not appreciable.
3	Adult; symptoms of acute articular rheumatism only; "acute articular rheumatism."	Acute rheumatism.	1 1 1	1 4 9	Delayed moderate. Delayed very slight. Not appreciable.
4	Adult; just convalescent after sickness giving characteristic symptoms and physical signs of pneumonia; "pneumonia."	Pneumonia	1 1 1 1	1 4 9 19	Immediate marked. Delayed moderate. Delayed slight. Not appreciable.
5	Adult; continued high fever; enlarged spleen; typhoid bacilli obtained from spleen; "typhoid fever."	Typhoid fever.	1 1 1	1 4 9	Immediate. Delayed incomplete. Delayed very slight.
6	Adult; relapse after four w'ks of continuous fever with typhoid symptoms; "relapse after typhoid fever."	Typhoid fever.	1 1 1 1 1	1 10 50 100 200	Marked immediate. Marked immediate. Marked immediate. Delayed moderate. Delayed slight.
7	Adult; seven days continued high fever; typhoid symptoms; two days later an atypical rash; "typhoid fever."	Typhoid fever.	1 1 1 1 1	1 9 49 99 199	Marked immediate. Marked immediate. Marked immediate. Delayed but marked Delayed moderate.

If other selected cases were added, a complete graduation in the intensity of the reaction with typhoid serum could be given. These seven suffice for the present purpose. It will be noted that two of the cases showed no reaction; neither of these had typhoid fever. A third gave a delayed moderate reaction with equal parts of the serum and culture; a fourth gave with this dilution an immediate marked reaction, and with one part to ten a delayed, slight reaction. No one of these four cases (which were not typhoid fever) gave an immediate marked reaction with a one in ten dilution, but one did give a delayed reaction. Of the typhoid cases one gave a reaction not more marked than that found in one of those not typhoid fever. The other two typhoids gave a characteristic reaction in a dilution twenty times greater than the others.

Our results have shown that in a certain proportion of cases not typhoid fever there occurs a delayed moderate reaction in a one in ten dilution of serum or blood; but very rarely, excepting in typhoid fever, does a complete reaction occur in this dilution within fifteen minutes. When dried blood is used the slight tendency of non-typhoid blood in one in ten dilution to produce agglutination is increased by the presence of the fibrinous clumps and perhaps by other substances derived from the disintegrated blood-cells.

The mode of procedure now employed is as follows: the test is first made with a one in ten dilution of serum or dried blood; if complete clumping and immobilization of the bacilli immediately occur, this is denominated "marked immediate typhoid reaction." The test is then repeated with greater dilutions.

If upon examination of the mixture in a hanging drop the bacilli show an immediate inhibition in their motility and a tendency to clump, and if upon later examination this clumping becomes marked within fifteen minutes, this is called a "moderate probable typhoid reaction." If within five minutes no change is noted in the motility of the bacilli, but slight clumping occurs later, this is noted for future reference and for its negative value; but such a reaction is never called a "typhoid reaction."

In order to determine whether the agglutinating substances are ever completely absent in typhoid fever, those cases in which no typhoid reaction has occurred in the usual one in ten dilution are retested with less dilutions of the serum. The complete absence of a reaction with equal parts of serum and broth-culture may be found to possess much greater value in excluding typhoid fever than a negative result obtained with the one in ten dilution.

THE PROPORTION OF CASES OF TYPHOID FEVER IN WHICH A DEFINITE TYPHOID REACTION OCCURS, AND THE TIME OF ITS APPEARANCE. In 108 cases in which, after the completion of the illness, a definite diagnosis of typhoid fever was finally made by the physician in charge, a marked immediate reaction occurred at the first test in 75. If the cases are arranged according to the day of the disease upon which the specimens were collected for examination, the following results are obtained:

Specimens collected.	Number of cases examined.	Reaction.		Percentage of positive results.
		Positive.	Negative.	
From 3d to 7th day	19	12	7	63 per cent.
During 2d week	39	23	16	59 "
" 3d week	24	19	5	79 "
" 4th week	9	8	1	88.8 "
" 2d month	17	13	4	76 "
	108	75	33	70 per cent.

The possibility that some of the cases giving no reaction and considered as typhoid fever by the physicians in attendance may not have had typhoid fever must be taken into consideration, yet many of these presented histories considered as fairly typical of typhoid fever. It is really not so important whether the reaction is present in 70, 80, or 90 per cent. of cases upon the first examination as that it is occasionally or frequently altogether absent.

In seventy-seven specimens from hospital cases in which the diagnosis was considered as almost certain, and in many of which several tests were made, there was a marked or definite typhoid reaction at some time in sixty-eight and only a slight reaction in nine. The reaction was never absolutely wanting. In hospital cases, therefore, in which repeated examinations were possible, a definite typhoid reaction was present in 88 per cent. of the cases at some time during the illness.

The majority of the cases that gave no reaction by the fourteenth day failed to give at any time a definite reaction; there were, however, two instances in which the reaction did not manifest itself until the middle of the fourth week, when the temperature had nearly reached the normal point.

The following case, in which numerous examinations were made, and which not only gave the symptoms of typhoid fever, but from the blood of whose spleen typhoid bacilli were obtained, is of great interest as proving that the blood of a typhoid patient may never, throughout the whole illness, have sufficient agglutinating substances in it to give a definite typhoid reaction in the usual dilution.

W. L., aged twenty years, Bellevue Hospital. No previous history of typhoid fever. Three weeks before admission had severe chill; during past two weeks has had continuous fever, and on admission presented the characteristic symptoms of typhoid fever. The temperature ranged between 103° and 104° for about ten days, and then fell to normal. Ten days later relapse occurred, which still continues at the time of writing, after the lapse of one week. Typhoid bacilli were obtained from the spleen by puncture on the twenty-fourth day. In this case throughout the first attack the reaction was never marked in a dilution above one part of serum to four of culture. On the second day of the relapse, however, the reaction became marked upon the addition of one part of serum to fifteen of culture.

If to the cases already tabulated are added those in which the duration of the disease at the time of the examination was not known, but in which the diagnosis of typhoid fever was established or excluded with considerable certainty, the following results are obtained:

		Reaction positive in one in ten dilution.	Reaction negative.
Number of cases finally believed to be typhoid	140	100	40
Number of cases finally believed not to be typhoid	57	0	57
Number of cases remaining in doubt, but regarded by the clinical observers as probably not typhoid . . .	3	0 3	
Total number of cases of suspected typhoid fever examined . . .	200		

The period of time between the infection and the appearance of the reaction is well shown by the experimental inoculation of man and animals with small amounts of dead typhoid bacilli.

Following the experiment performed by Pfeiffer, in which he inoculated three healthy adults with small amounts of dead bacilli, we injected nine guinea-pigs with one-tenth of a loop of typhoid bacilli killed by exposure for one hour to heat at 55° C. The blood of these pigs was examined daily or on every alternate day by Dr. A. W. Williams, Assistant Bacteriologist to the Health Department, for the appearance of the typhoid reaction. As in Pfeiffer's experiments on man, the agglutinating substances did not appear in any experiments until the sixth day, and in all it appeared by the eighth day. The agglutinating substances gradually diminished, but were still present in appreciable quantity at the end of four weeks.

THE PERSISTENCE OF THE REACTION. The following table shows the results as to the persistence of the reaction in the cases examined:

Convalescent.	Cases.	Reaction.
3 to 4 months .	8	Marked in 3, moderate in 2, very slight in 3.
1 year . .	1	Very slight, not definite typhoid.
3 years . .	1	None.
5 years . .	1	Very slight.
14 years . .	1	None.

The reaction disappeared on the thirty-fifth day in one case in which it had been marked on the thirtieth day.

THE REACTION WITH THE BLOOD-SERUM OF HEALTHY PERSONS AND OF THOSE SICK WITH DISEASES OTHER THAN TYPHOID FEVER. The reaction has never been observed in a one in ten dilution of the blood-serum of over one hundred healthy persons examined. Fifty-three persons have been examined who were regarded as having typhoid fever when the specimens of blood were collected, but in whom the subsequent history or the autopsy practically excluded this diagnosis. In no one of them did the blood give a marked immediate reaction in a one in ten dilution. Several gave a delayed partial reaction. These

cases, if divided according to the duration of illness when the examination was made, become grouped as follows:

Number examined during		1st week	. . . . .	13
"	"	"	2d "	27
"	"	"	3d "	6
"	"	"	4th "	4
"	"	"	2d month	3
				53

Besides these there were three cases which had a continuous, irregular temperature, but no other symptoms of typhoid fever. The blood of two of these gave an immediate definite reaction in dilution one in ten with the broth-cultures of the typhoid bacillus. The third gave an immediate moderate reaction.

These cases were treated at the Roosevelt and Bellevue Hospitals. In no one of the three was the nature of the illness determined. They were all colored adults. The histories of the cases are as follows:

CASE I.—Charlotte B., aged forty-five years, colored. Patient so ignorant as to make previous history untrustworthy. No history of previous typhoid obtained. For a few months she has had attacks of abdominal pain. Present illness began three days ago with nausea, vomiting, and pains in right iliac fossa.

Physical examination on admission showed tenderness most marked in right iliac region; no tumor discovered. Spleen not noticeably enlarged. Temperature on admission 103.6°, and varied afterward between 103° and 104° for four days, then fell gradually during six days to 98.4°. Pulse varied from 90 to 105. Respirations 36 to 24. Three days after fall of temperature patient had a relapse, lasting a week. Temperature reached 104° F. on the third day. After partial subsidence of temperature an operation was performed for a possible appendicitis, but an inoperable tumor of the ascending colon was found. After the operation the temperature gradually subsided to normal and has remained so up to the present time, a period of two months, notwithstanding the continued growth of the tumor. Bowels were slightly costive throughout the illness. On the fifth day of her illness a solution of dried blood when mixed with the typhoid culture gave an immediate, very marked reaction in dilution one in ten.

During the first week of convalescence the reaction continued to manifest itself, but at the end of one month it had disappeared. In this case the previous history is valueless. Of typhoid symptoms there were none except the continued high temperature. No reason for the elevation of temperature was discovered. The tumor of the intestines hardly seems to have been the cause of the continued fever or of the substances giving the typhoid reaction, as they both subsided in spite of the continued growth of the tumor.

CASE II.—Thomas I., colored, Bellevue Hospital. Patient has not felt well for four weeks. Has lost some flesh and feels prostrated. No headache; feet and ankles swollen and painful for a week; appetite poor; bowels costive. On admission: temperature 101.4°, pulse 100, respiration

32. Physical examination negative, except that there is some swelling and œdema of the feet and ankles, with slight tenderness on pressure. Spleen not noticeably enlarged. History after admission to the hospital: temperature gradually subsided to nearly normal in four days and remained with morning temperature between 98° and 99° and evening between 99° and 100° for five days. It then rose to 104° and remained high for one week, after which it gradually subsided to nearly normal and remained so with the exception of two transitory rises.

The first rise in temperature was accompanied by increased general tenderness and heat in ankles and feet. Two days later there appeared areas of anæsthesia in skin of feet and toes and superficial gangrene of portions of toes and left foot, but the pain had disappeared from ankles and feet and patient felt better. He gradually improved and made a good recovery. Results of examination of serum: blood examined by Dr. J. W. Brannan seven days after admission showed no definite reaction. The blood, examined on the second day of relapse and at frequent intervals until patient was discharged, gave marked immediate reaction in a dilution one in ten, and a delayed incomplete reaction in a dilution one in twenty.

Case III.—Adult, colored. As the reaction in a dilution one in ten, though fairly marked, was not complete, only a brief history will be given. Patient stated that he had been well until three days before admission, when, after wrestling, he had coughed up blood. On admission his temperature was 103°, pulse 90, respiration 26. Excepting for some signs of bronchitis, no physical signs of disease were found. Spleen apparently not enlarged.

An irregular fever, with temperature averaging about 103°, continued for two weeks, after which it gradually subsided. Except for the prostration and fever, there were no characteristic typhoid symptoms. On admission the diagnosis was acute phthisis or typhoid fever. The signs of disease in the chest disappeared, and patient was discharged cured.

In addition to the examinations made of the blood of persons supposed to have typhoid fever, in eighty-seven cases examinations have been made of the blood of persons who were sick with other diseases, such as tuberculosis, rheumatism, appendicitis, malignant tumors, diphtheria, scarlet fever, measles, leprosy, meningitis, leukæmia, etc. The serum from only one of these gave a marked immediate reaction in a one in ten dilution, and in this case the final diagnosis was doubtful.

The differential diagnosis of typhoid and typhus fevers is often of very great importance in a sanitary way, and in the absence of an epidemic of typhus fever is often difficult or impossible. It therefore becomes of great importance to determine whether the serum-test for the diagnosis of typhoid fever will serve to differentiate these diseases. Typhus fever is endemic in Liverpool, and with the hope of determining this question we requested Dr. E. W. Hope, Medical Officer for Health of Liverpool, to forward some samples of typhus blood. He very kindly sent three samples in capillary tubes; as we were afterward informed, all from cases in the same family. Two of these showed no

reaction, even when the serum and culture were mixed in equal parts; one showed a marked reaction. The possibility of a mistaken diagnosis of this case is strongly suggested, although we are informed that the case was one typical of typhus fever. As no other data on this question are at hand, it must be left unanswered for the present.

THE EFFECT OF THE SERUM FROM THE BLOOD OF THOSE SUFFERING FROM TYPHOID FEVER UPON OTHER VARIETIES OF BACILLI. Achard has found that certain bacilli, which, though closely allied to the typhoid bacillus, are still to be clearly distinguished from it, show the same clumping when mixed with the serum of immunized animals as the typhoid bacillus.

He also describes three cases from which these bacilli were obtained in which the serum of the patients caused marked clumping of the typhoid bacilli in dilution not greater than one in ten.

We have found that a number of varieties of motile bacilli other than the typhoid bacillus are clumped by the serum from persons suffering from typhoid fever, even when the serum is used in quite high dilutions.

These bacilli are also clumped, but to a much less extent, with serum from some persons suffering from other diseases. These experiments, which have been carried on chiefly by Dr. Hiss, Assistant Bacteriologist to the Health Department, are still incomplete.

A careful study of all the cases examined has been made to determine whether the agglutinating substances are more likely to be present in cases of typhoid fever which run a typical course than in those which present an irregular type of the disease.

An analysis of the 140 cases detailed above shows that although a reaction is perhaps more frequently obtained in the characteristic cases, yet it is often very strongly marked in atypical forms of the disease.

ANALYSIS OF RESULTS. The clumping and immobilization of the typhoid bacilli in broth-cultures occasionally caused by the blood-serum of persons ill with diseases other than typhoid fever are apparently identical with those caused by the serum from cases of typhoid fever; the difference being that in the latter the agglutinating substances are usually present in far greater amount. As, therefore, the serum-test for the diagnosis of typhoid fever is quantitative and not qualitative, it becomes necessary that a large number of examinations be made before it can be determined to how great an extent these agglutinating substances may be present in non-typhoid blood.

The exact diagnostic value of the serum-test and its precise limitations can only be determined when this is known. It is possible, however, to arrive at a probable estimate of its value from the results already obtained. From our investigations it would appear that the agglutinating substances are present in the blood-serum of over two-thirds of the cases

of typhoid fever by the end of the first week, in sufficient concentration to give a reaction with broth-cultures of the typhoid bacillus when these are mixed in the proportion of one to ten. A reaction with this dilution does not occur in more than 2 per cent. of non-typhoid cases. The reaction occurs in a dilution of one part of serum to forty parts of a broth-culture in over one-half of the cases of typhoid fever by the end of the first week; with this dilution the reaction rarely, if ever, occurs when serum from other cases is used.

It seems probable, therefore, that a positive diagnosis may be reached in 50 per cent. of the cases of typhoid fever, and a probable diagnosis in half the remaining cases, by estimating the amount of the agglutinating substances in the blood.

The absence of the reaction in a one to ten dilution in any case in a single examination does not exclude the diagnosis of typhoid fever, but the absence of the reaction in a series of examinations in a single case has decided value in probably excluding this disease.

The absence of the reaction will be useful in excluding typhoid fever in doubtful local epidemics where several cases can be examined, and in determining the nature of some fevers of a doubtful character; for although in no single case can typhoid fever be excluded, yet if the reaction occurred in no one of several cases this would clearly indicate that as a class these were not of the nature of typhoid fever. It is possible, also, that further examinations may show that where undiluted serum is used the complete absence of reaction has great value in positively excluding typhoid fever.

The direct microscopical examination, in the hanging drop, of a broth-culture of the typhoid bacillus and serum or blood mixed in proper proportions is the best method of applying the serum-test for general diagnostic purposes because of the small amount of serum or blood required. This method also seems as reliable as any.

Dried blood and blood-serum have given practically identical results; but there is a decided advantage in the use of the serum, because it may be used in a more concentrated mixture with the broth-culture than the dried blood in solution, and the proportions in the mixture may be more accurately determined. With dried blood in solution, the reaction, to be of value, should be fairly developed within a few (ten) minutes. With serum a longer time may be allowed for the development of the reaction, as pseudo-reactions are less likely to occur.

The duration of persistence in the blood, after convalescence, of the substances giving the reaction, varies greatly in different cases. In a few instances these substances rapidly diminish in amount; in most cases, however, they remain for some months, and exceptionally to a moderate extent for years. The substances rarely, if ever, persist more

than a year in sufficient quantity to interfere with the diagnostic value of the test in a subsequent illness.

This test will apparently be of value in many doubtful cases of typhoid fever in which the diagnosis remains uncertain after the fifth day of the illness, and in the differential diagnosis of those irregular forms of the disease which it is often difficult to distinguish clinically from typhus fever: malarial fever, miliary tuberculosis, malignant endocarditis, septicæmia, etc.

While the test is passing through the experimental stage it is impossible to make such positive statements as to the diagnostic value to be attached to the presence or absence of the reaction in any given case as may, perhaps, be permitted at a later time.

Meanwhile all observers in reporting cases should carefully note the method of examination, the dilution of serum or blood employed, and the exact grounds upon which the diagnosis is based. Those cases in which exact pathological or bacteriological examinations are obtained will be of especial value.

It is probable that there are obscure forms of disease due to the typhoid bacillus not now recognized as typhoid fever, and also other febrile affections now considered as typhoid fever which are really of another nature; therefore, unless great caution is observed in drawing conclusions, the reaction will be stated to have been present in cases, which were not typhoid fever when in reality these cases were typhoid fever; and, on the other hand, the reaction will appear to have been too frequently absent in cases of typhoid fever, because some of the cases were really of some other nature.

The method of serum-diagnosis in typhoid fever is simple and easy of performance in the laboratory by an expert bacteriologist, but it cannot be recommended for routine employment by the practising physician as a clinical test.

We desire, in conclusion, to express our obligations to many physicians for numerous data furnished, and also especially to Drs. Tillinghast and Clarke, of Roosevelt Hospital, and Drs. Don, Bigelow, and Goldberger, of Bellevue Hospital. Valuable assistance was rendered in these investigations by many members of the laboratory staff of the Health Department, and particularly by Drs. Lambert, Williams, Hiss, Guerard, and Wilson, assistant bacteriologists.

Bibliography.

Pfeiffer and Kolle: Zeitschrift f. Hyg., Bd. xxi. p. 203.
Pfeiffer: Deutsch. med. Wochenschrift, 1896, Nos. 7 and 8.
Pfeiffer and Kolle: Ibid., No. 12.
Pfeiffer: Centralblatt f. Bakt., 1896, xix. p. 593.
Max Grüber: Wien. klin. Wochenschrift, 1896, Nos. 11, 12, and 14.
Grüber: Münch. med. Wochenschrift, 1896, No. 9.

Herbert E. Durham: Proceedings of the Royal Society, January 23, 1896, vol. lix., No. 355. Abstract in Brit. Med. Journ. *Epitome*, March 14, 1896.
Durham: Lancet, December 19, 1896.
Albert S. Grünbaum: Lancet, September 19, 1896, and December 19, 1896.
Sheridan Delépine: Medical Chronicle, October, 1896, and Lancet, December 5 and 12, 1896.
F. Widal: La Presse Médicale, July 29, 1896; La Semaine Méd., July 31; and Journ. de Méd., 1896, p. 533.
Widal and Sicard: Le Bulletin Méd., September 19, 1896.
Widal: Lancet, November 14, 1896.
Achard and Bensaude: Bulletin Méd., 1896, p. 933; La Semaine Méd., p. 295
Chantemesse, Achard, Widal, Hayem, Courmont, etc.: La Semaine Méd., 1896, p. 303.
Dieulafoy: Bulletin Méd., 1896, p. 655.
Vedel: Ibid., p. 768.
Haushalter: Ibid., p. 769.
Theolen and Mills: La Clinique (Brussels), August 6 and September 3, 1896.
Bordet: Annales de l'Institut Pasteur, April, 1895.
Greene: New York Medical Record, November 14, 1896.
Johnston: New York Med. Journ., October 31, 1896; Brit. Med. Journ., December 5, 1896.

THE EFFECT OF ANÆSTHESIA UPON TEMPERATURE AND BLOOD-PRESSURE.[1]

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This paper is based upon observations made upon thirty-five dogs and eighty patients. To these have been added the conclusions which seem to be warranted by the observations.

Before beginning to detail the experiments it may be desirable to state what led to their being undertaken. An extended observation of most of the noted surgeons, both of Europe and America, led me to question the special causes of their success or failure. Without considering the subjects of sepsis and antisepsis, there were three factors which particularly attracted my attention. Some surgeons were very slow in their operations, and seemed to disregard the loss of heat during prolonged operations upon patients with inadequate covering. I have seen one of the most noted surgeons of Germany perform a laparotomy lasting nearly two hours, the patient covered only with a couple of sheets, in a room with the window open, in which it was uncomfortably cool for me while watching the operation, clad in a winter suit. Another surgeon of equal reputation performed all his laparotomies with the patient lying upon a glass slab covered only with a sheet. On the other hand, I have seen another surgeon, equally noted, much less careful in his asepsis, but still very successful. He exercised, however, the greatest care to prevent loss of time and loss of blood, and to keep the patients well protected and warm

[1] Read before the American Surgical Association, 1896.

The question arose, if some definite knowledge could not be obtained with reference to the importance of the loss of temperature on the part of patients, as well as the loss of blood and the loss of time. There are evidently very great difficulties in the way of studying this subject successfully upon human beings. If one believes there are dangers in the direction mentioned, he is compelled to avoid them. For this reason it is difficult to make any statement as to the dangers arising in this direction from operations upon my own patients, since I have under all circumstances avoided them as much as possible. It is well known, however, that patients who have suffered serious injury are often brought to the hospital in a condition of shock. The temperature of such patients is often very low, and the prognosis in the case may in a degree be based upon the temperature, a low temperature being of serious significance. Is it not possible that the low temperature usually ascribed to shock may in part be due to the exposure incident to casualties in which patients are much exposed on account of inadequate covering?

I might also cite an operation which I saw performed by an eminent surgeon upon a child six years of age, the operation being excision of the knee-joint. The anæsthetic was chloroform, and the operation lasted forty minutes, the child being exposed, and no care being taken to keep it covered or preserve it from loss of heat. I was permitted to follow the patient to the ward, and a thermometer placed in the rectum for five minutes after the patient had been placed in bed registered 35.7° C., equal to 95.2° F. From what I have observed, I am satisfied that many patients go from the operating-table with great loss of temperature.

In order to study the effect of anæsthesia I made a series of experiments. In these experiments I had the benefit of the valuable cooperation and suggestion of Dr. John P. Sawyer, at that time Professor of Physiology in the Medical Department of the Western Reserve University, and was also aided by Drs. Millikin, Upson, and Sihler, of the same institution. In some of these experiments several dogs were used, in order to confirm the observations. The questions studied in the experiments were chiefly these:

1. The effect of various anæsthetics, viz., ether, chloroform, and the A.-C.-E. mixture, upon the temperature of dogs. Anæsthesia was produced under varying conditions: *a*, upon dogs without any artificial covering; *b*, upon dogs enveloped in cotton-batting; *c*, upon dogs enveloped in cotton-batting and surrounded by bottles filled with hot water (all these experiments being made in a room having a temperature of 65° to 70° F.); *d*, upon dogs without artificial covering, but in a room having a temperature of from 93° to 96° F.

2. Observations were made upon a series of dogs of the changes in temperature and blood-pressure taking place under anæsthesia associated with the withdrawal of blood from the circulation.

3. Observations were made upon the temperature and blood-pressure of dogs, under anæsthesia, suffering from the following injuries: *a*, fracture of the legs; *b*, amputations performed quickly without loss of blood; *c*, amputations performed slowly with considerable loss of blood.

The blood-pressure was measured by the kymographion, the glass pen floating upon the mercury of the U-tube, connection being made with the common carotid artery. The study of temperature and blood-pressure was undertaken as offering the most reliable evidence of the effect produced upon an animal by the depression of anæsthesia, bloodletting, and injury. The variations of the pulse were so rapid and great as to render observations in this direction valueless.

4. Observations were also made of the action of atropia, ergot, and alcohol in their effect upon temperature under anæsthesia.

The first two observations were made upon dogs in their normal condition—that is, without anæsthesia or injury.

EXPERIMENT I. Dog 1. Short hair; weight, thirty pounds; temperature, 102.5°; no covering; no anæsthetic. The temperature was taken during one and a half hours, the dog resting quietly upon a table. During the observation there was a gain in temperature of 0.3°.

Dog 2. Short hair; weight, thirteen pounds; temperature, 103.4°; covered with cotton-wadding and a blanket; no anæsthetic; temperature observed during one and one-half hours, the dog being covered all the time. The dog lost in temperature 0.6°.

It will thus be seen that one dog under normal conditions gained during one and one-half hours 0.3°; another dog, although thoroughly covered so as to prevent radiation, actually lost 0.6°. It is quite probable, however, that these variations in temperature are entirely within normal limits.

EXPERIMENT II. This experiment was performed upon three dogs, to ascertain the effect upon the temperature of a dog, without covering, to which ether was administered.

Dog 3. Short hair; weight, thirteen pounds; temperature before anæsthetization, 102.7°; the dog was uncovered; anæsthetic, ether. At the end of one hour the temperature was 94.8°; at the end of one and one-half hours, 93°. On stopping the anæsthetic the dog had a severe chill, and recovered consciousness very slowly. One-half hour after stopping the anæsthetic the temperature was 99°.

Dog 4. Short hair; weight, thirty pounds; temperature before anæsthetic, 102°; dog uncovered; anæsthetic, ether. At the end of one hour temperature was 101.2°; at the end of one and one-half hours, 99.2°. The recovery was rapid.

Dog 5. Long hair; weight, twenty-eight pounds; temperature before anæsthetic, 102°; uncovered; anæsthetic, ether. Temperature at the end of one and one-half hours, 98.5°.

On comparing these dogs it will be seen that they lost heat under the anæsthetic while uncovered. The dog which weighed thirteen pounds lost heat vastly more rapidly than the other two, which weighed more than twice that amount.

EXPERIMENT III. This experiment was upon two dogs; both were uncovered; anæsthetic, chloroform.

Dog 6. Long hair; weight, thirty-six pounds; temperature before anæsthetic, 103.3°; no covering; anæsthetic, chloroform. Temperature one-half hour after beginning to administer chloroform, 103.6°; one hour, 102.2°; one and one-half hours, 101.6°. Anæsthetic was discontinued, and one-half hour later the temperature had declined to 99.4°. One hour after stopping the chloroform the temperature was 98.9°.

Dog 7. Long hair; weight, twenty pounds; uncovered; anæsthetic, chloroform; temperature before chloroform, 103°. One-half hour after beginning to administer chloroform the temperature was 105°; one hour, 104.8°. The dog died one hour and thirty-five minutes after the administration of chloroform was begun. This animal was particularly difficult to anæsthetize, and struggled with most extreme violence, so that the record of temperature in this case was hard to interpret. The increase of temperature is probably due to the constant struggling of the dog.

The striking thing about Dog. 6 is that while the loss of temperature under chloroform does not vary greatly from that of the dogs to which ether was administered, the loss of temperature was continued after the stopping of the chloroform.

EXPERIMENT IV. The same experiment as those preceding was undertaken, except that the anæsthetic was the A.-C.-E. mixture.

Dog 8. Short hair; weight, twenty-seven pounds; temperature before anæsthetic, 102.8°; uncovered; anæsthetic, the A.-C.-E. mixture. Temperature one-half hour after beginning anæsthesia, 102.8°; one hour, 101.6°; one and one-half hours, 99.5°. After stopping the anæsthesia, in one-half hour the temperature was 98.2°; in one hour it was 99°. After stopping the anæsthesia one-half hour the dog had a chill.

It will be noticed that the results with the A.-C.-E. mixture correspond closely with those obtained under chloroform.

EXPERIMENT V. This experiment was upon two dogs, to which ether was administered; the dogs were covered with cotton, but no artificial heat was employed.

Dog 9. This experiment is of special interest, since the same dog was employed as that previously numbered Dog 3. Short hair; weight, thirteen pounds; temperature before anæsthesia, 103.2°; covered with cotton-wadding; no hot bottles; anæsthetic, ether. One-half hour after beginning anæsthesia the temperature was 102°; one hour, 102.5°; one and one-half hours, 102.1°. The anæsthesia was stopped, but the dog was kept carefully covered. A half-hour later the temperature was 101.9°.

Dog 10. Long hair; weight, fifty-one pounds; temperature before beginning anæsthesia, 101.4°; dog covered with cotton-wadding; no hot bottles; anæsthetic, ether. One hour after beginning the anæsthesia temperature was 102°; two hours, 102.6°; two hours and thirty-four minutes, 103.4°. The anæsthesia was stopped and the dog kept carefully covered, and one-half hour later the temperature was 102.8°.

On observation it will be found that the small dog, weighing thirteen pounds, which under ether and without covering lost in one and one-half hours 9.7°, when covered lost in the same period but 1.1°. The large dog, weighing fifty-one pounds, instead of losing temperature under the anæsthetic while covered, actually gained 2° in temperature. When

the ether was stopped, although the covering was continued, the temperature returned to normal.

EXPERIMENT VI. This experiment was made upon four dogs; to part was given ether, to others chloroform; all were covered with cotton-wadding and surrounded by hot bottles.

Dog 11. Long hair; weight, twenty-eight pounds; temperature before anæsthesia, 102.3°; anæsthetic, ether; covered with cotton-wadding and surrounded by hot bottles. Temperature one-half hour after beginning the anæsthesia, 103.8°; one hour, 104.7°; one and one-half hours, 105.2°. The anæsthesia was discontinued, but the dog was kept covered as before. In a half-hour after discontinuing the anæsthesia the temperature was 103.3°. This dog had a long period of excitement in going under the anæsthetic.

Dog 12. Long hair; weight, thirty-five pounds; temperature before anæsthesia, 102.9°; covered with cotton and surrounded by hot bottles; anæsthetic, chloroform. One-half hour after beginning the anæsthesia the temperature was 103.5°; in one hour, 104.3°; in one and one-half hours, 104°. With the covering continued as before, and the anæsthesia stopped, the temperature in one-half hour was 102.7°; in one hour, 101.4°. The dog panted constantly while taking the anæsthetic.

Dog 13. Long hair; weight, twenty-six and one-half pounds; temperature before anæsthesia, 103.1°; covered with cotton-wadding and surrounded by hot bottles; anæsthetic, chloroform. Temperature one-half hour after beginning anæsthesia, 104.1°. The dog died suddenly in a little less than an hour.

Dog 14. Long hair; weight, fifty-one pounds; temperature before anæsthesia, 103°; covered with cotton-wadding and surrounded by hot bottles; anæsthetic, ether. Temperature one-half hour after beginning the anæsthesia, 101.6°; one hour after, 102.4°. The dog died suddenly a little less than one and one-half hours from the beginning of the anæsthesia.

It will be noticed that Dogs 11, 12, and 13 all gained markedly in temperature under anæsthesia with artificial covering and hot bottles. Dog 14 lost somewhat at first, but died before the observation at the one and one-half hour period could be made. Dog 12, to which chloroform was administered, increased in temperature; but when the administration of chloroform was discontinued the temperature sank below normal.

The conclusions drawn from the anæsthetization of dogs while covered and surrounded by hot water almost all point to the fact that under these circumstances the temperature can actually be increased.

EXPERIMENT VII. Three dogs were given doses of fluid extract of ergot, two with and one without an anæsthetic.

Dog 15. Long hair; weight, thirty-five pounds; no anæsthetic; no covering. Temperature before hypodermatic, 102°. Hypodermatic, fluid extract of ergot, ℥xxv. Temperature one hour later, 101.6°.

Dog 16. Long hair; weight, seventeen pounds; temperature before anæsthetic, 102.5°; uncovered; anæsthetic, ether. Administered ℥xxv fluid extract of ergot. Temperature one-half hour after beginning anæsthesia, 100.7°. The dog died suddenly a little later.

Dog 17. Short hair; weight, twenty-seven pounds; temperature before anæsthesia, 102.3°; uncovered; anæsthetic, ether. Administered ℥xxv fluid extract of ergot. Temperature one-half hour after begin-

ning the anæsthesia, 102.8°; one hour, 102°; one and one-half hours, 100.8°. Temperature one-half hour after stopping anæsthesia, 101.2°.

EXPERIMENT VIII. Three dogs received injections of sulphate of atropia, one without and two with an anæsthetic.

Dog 18. Short hair; weight, thirteen pounds; temperature at the beginning of observation, 102.4°; no covering; no anæsthetic. Hypodermatic, sulphate of atropia, $\frac{1}{200}$ gr. Temperature one and one-half hours after hypodermatic, 102°.

Dog 19. Short hair; weight, thirty pounds; temperature before anæsthesia, 103.1°; uncovered; anæsthetic, ether; hypodermatic, sulphate of atropia, $\frac{1}{200}$ gr. Temperature fifteen minutes after beginning the anæsthesia, 103.1°; forty-five minutes, 102°; one and one-half hours, 101.2°. The temperature one-half hour after stopping the anæsthesia was 102.° The dog had a marked chill after stopping the anæsthesia.

Dog 20. Long hair; weight, thirty-six pounds; temperature before anæsthesia, 102.5°; uncovered; anæsthetic, ether; hypodermatic, sulphate of atropia, $\frac{1}{200}$ gr. Temperature fifteen minutes after beginning anæsthesia, 103.3°; forty-five minutes, 102.4°; one and one-half hours, 101.8°. One-half hour after stopping anæsthesia temperature was 101.2°.

A comparison of the dogs which received hypodermatics of ergot and sulphate of atropia, although insufficient in number to draw positive conclusions, would seem to indicate that the action of these drugs tends in a degree to diminish the loss of heat under anæsthesia. It will be observed that all of these dogs were uncovered, and their average loss of heat is less than that of other dogs similarly anæsthetized, uncovered, but without hypodermatics of atropia or ergot.

EXPERIMENT IX. Three dogs were anæsthetized with ether, uncovered, and various amounts of blood were withdrawn from the circulation, the amounts being proportioned to the weight of the dog.

Dog 21. Long hair; weight, thirty-five pounds; temperature before anæsthesia, 101.6°; no covering; anæsthetic, ether. One-half hour after beginning the anæsthesia temperature was 101.3°. At this time six and one-half ounces of blood were withdrawn. One-half hour after bleeding temperature was 101.2°; one hour after bleeding, 101.1°. The anæsthesia was stopped, and one-half hour later the temperature was 101°.

Dog 22. Short hair; weight, twenty-seven pounds; temperature before anæsthesia, 102.1°; uncovered; anæsthetic, ether. Temperature one-half hour after beginning the anæsthesia, 101.6°. At this time nine ounces of blood were withdrawn. Temperature one-half hour after bleeding, 99.4°; one hour after bleeding, 98.1°. Anæsthesia was discontinued, and one-half hour later the temperature was 100.5°.

Dog 23. Long hair; weight, ten pounds; temperature before anæsthesia, 102.1°; uncovered; anæsthetic, ether. Fifteen minutes after beginning the anæsthesia three ounces of blood were withdrawn. One-half hour later, temperature 102.4°; one hour later, 103.1°.

It is not easy to interpret the findings in these three dogs. Dog 21 lost but 0.5°, Dog 22 lost 4°, and Dog 23 gained 1°. It is a fact known to physiology that the immediate effect of the withdrawal of considerable amounts of blood is to increase the temperature. Perhaps the amount of blood withdrawn in these cases is not sufficient to have a marked effect upon them, since one dog remained practically

without change, one dog lost 4°, and one gained 1°. Without more experiments in this direction it would be impossible to draw deductions from them.

EXPERIMENT X. This experiment was upon two dogs, anæsthetized without covering, to which enemata of whiskey were given.

Dog 24. Long hair; weight, twenty-eight pounds; temperature before anæsthesia, 101.6°. One-half hour later six ounces of blood were withdrawn. One-half hour after bleeding the temperature was 98°; one hour after bleeding, 97.6°. Just before the bleeding an enema of one ounce each of whiskey and water was administered.

Dog 25. Short hair; weight, thirty pounds; temperature before anæsthesia, 102.7°; uncovered; anæsthetic, ether. One-half hour after beginning the anæsthesia withdrew nine ounces of blood. Temperature just after bleeding, 101.9°. Just before bleeding gave an enema of whiskey and water, each one ounce. Temperature one-half hour after bleeding, 100.2°; one hour after bleeding, 98.6°. Anæsthesia was discontinued, and one-half hour later the temperature was 98.9°.

On observation it will be seen that Dogs 24 and 25 were both large dogs, and the loss of heat was about 4° in each case. From these experiments it would appear that the use of enemata of whiskey caused an increased loss of heat under anæsthetics.

The second series of experiments was much more complicated and difficult than those which have just been detailed. In addition to observations upon temperature, observations were made upon blood-pressure. As has already been said, these were recorded upon a revolving drum, by means of a glass pen floating in a U-tube of mercury and connected with the common carotid artery of the dog. The first record of blood-pressure was made in all cases after the dog had become anæsthetized, as earlier the dog's struggles caused wide variations of blood-pressure.

The experiments were modified by various operations, such as the withdrawal of blood, the production of fractures, amputations, etc., which will now be described in detail.

EXPERIMENT XI. Dog 26. Long hair; weight, thirty-six pounds; uncovered; anæsthetic, ether. Temperature at 10 P.M., just before administering the anæsthetic, 101.6°. Temperature at 10.40, 101.7°; at 11.15, 101.7°; at 11.30, 100°; at 11.50, 99.7°. Blood-pressure at 10.30 P.M., 96 mm.; at 11.15, 86 mm.; at 11.48, 90 mm. This dog, which was a large one, lost under ether 1.9° of temperature and but 6 mm. of blood-pressure.

EXPERIMENT XII. Dog 27. Short hair; weight, twenty-four and one-half pounds; uncovered; anæsthetic, chloroform. Temperature at 9.30 P.M., just before beginning anæsthesia, 103.3°. At 9.25 P.M. a hypodermatic of atropia sulphate, $\frac{1}{150}$, morphine sulphate, $\frac{1}{12}$, was given. Temperature at 10.13, 101°; at 10.35, 100°; at 11.05, 99.6°; at 11.30, 99.9°. Anæsthesia stopped at 11.30; at 12, temperature 99.4°. Blood-pressure at 9.45, 130 mm.; at 10.35, 112 mm.; at 11.22, 96 mm.; at 11.30, 97 mm.

It will be seen that this experiment corresponds closely to that of

Dog 4; there is a marked loss of heat, and after the chloroform was stopped in both cases the temperature continued to fall. There is also a loss of 33 mm. of blood-pressure. The amounts of atropia and morphine given in the cases were small, probably scarcely enough to affect the experiments. They were given since a number of dogs had died under chloroform, and it had been suggested, and is a well-known fact, as mentioned by Dastre in his work on *Les Anesthésiques*, that chloroform-anæsthesia upon dogs is rendered more safe by this method.

EXPERIMENT XIII. This experiment is of special interest on account of the fact that the dog was uncovered and in a room of high temperature.

Dog 28. Short hair; weight, twenty-three and one-half pounds; uncovered; anæsthetic, ether. Temperature at 8.40 P.M., just before beginning the anæsthesia, 102°; 9.10, temperature of room, 96°, temperature of dog, 104.3°; 9.40, temperature of room, 92°, of dog, 105.4°; 10.10, temperature of room, 93°, of dog, 106.1°; 10.47, temperature of room, 93°, of dog, 106.4°. The dog panted violently during the observation. The blood-pressure at 9.15 was 130 mm. Repeated observations were taken, but all need not be recorded. At 9.26 the blood-pressure was 118 mm.; at 10 it was 115 mm.; at 10.55, 98 mm. It will thus be observed that although the dog was uncovered, with short hair and medium weight, the heat of the room was sufficient, even under profound anæsthesia, to raise the temperature 4.4°. In spite of the great elevation of temperature the blood-pressure decreased 32 mm. Under the anæsthesia the dog perspired very freely, and after it was stopped recovered slowly and seemed to be extremely exhausted; much more exhausted than was observed in the case of any dog, unless it was Dog 3, which lost 9.7° under anæsthesia while uncovered.

EXPERIMENT XIV. This experiment was upon a dog covered and surrounded by hot bottles.

Dog 29. Long hair; weight, fifty-five pounds; anæsthetic, ether; covered with cotton-wadding and surrounded by hot bottles. These were applied one-half hour after beginning the anæsthesia. Temperature at 9 P.M., just before beginning the anæsthesia, 102.4°; at 9.45, 102.8°; at 10.10, 104.4°; at 10.40, 105.1°; at 11, 106.1°. The temperature one-half hour after stopping the anæsthesia, the covering and hot bottles being removed, was 101.9°. The dog panted violently while covered, but panting ceased when covering was removed. At 9.30 the blood-pressure was 112 mm.; at 9.45, 136 mm.; at 10.5, 154 mm.; at 10.33, 176 mm.; at 11, 176 mm. This experiment is of very great interest in comparison with that preceding. This dog gained while covered 3.7° of temperature. Dog 28 gained 4.4° of temperature. This dog gained 64 mm. in blood-pressure, whereas Dog 28 lost 32 mm. Dog 29 did not show the exhaustion which appeared in Dog 28.

It would seem after these two experiments that whereas the dog's temperature may be increased under profound anæsthesia by the warm air of a room, or by warm covering and hot bottles, in a heated room the blood-pressure is decreased; whereas in a room of ordinary temperature the blood-pressure is increased. The dog is also much less exhausted in a room of ordinary temperature than in a hot room. It would appear, therefore, that the advantage was vastly in favor of warm covering, in a room of ordinary temperature, since the exhaustion is less and loss of temperature and blood-pressure is prevented.

EXPERIMENT XV. This experiment was one in which there was a compound fracture of the femur, followed by amputation.

Dog 30. Long hair; weight, thirty-six pounds; uncovered; anæsthetic, ether. Temperature at 9.03 P.M., before beginning anæsthesia, 102.7°. Temperature at 9.40 was 102°; at 10.15, 100.7°; at 10.59, 99.6°. Anæsthesia stopped at 11. Temperature at 11.30, 100.2°. At 9.38 there was a compound comminuted fracture made with laceration. Amputation of the femur was begun at 10.15 and ended at 10.31. At 9.35 blood-pressure was 110 mm.; at 9.50, 96 mm.; at 10.13, 104 mm.; at 10.30, 82 mm.; at 10.40, 72 mm.; at 10.45, 88 mm.; at 10.53, 85 mm. It will be observed that this dog lost 3.1° of temperature during one and one-half hours, and the loss in blood-pressure was 25 mm. during the whole period of observation. Just after the close of the amputation the loss in blood-pressure had amounted to 38 mm. It will thus be observed that in this dog the loss in temperature and blood-pressure is associated under anæsthesia, without covering and during prolonged operation.

EXPERIMENT XVI. In this experiment three legs were amputated, great care being taken to prevent loss of blood.

Dog 31. Short hair; weight, twenty-six pounds; anæsthetic, ether; uncovered. Temperature before the beginning of the anæsthesia at 9.03 P.M. was 103°. At 9.35 the temperature was 101.6°; at 10, 102°. Three legs were amputated, being constricted with rubber bands, so there was no loss of blood. The right hind-leg was amputated at 9.21, the right fore-leg at 9.25, and the left fore-leg at 9.27½. Blood-pressure at 9.15 was 122 mm.; at 9.20, 132 mm.; at 9.22, 163.5 mm.; at 9.24, 175 mm.; at 9.25, 206 mm.; at 9.26, 185 mm.; at 9.29½, 192 mm.; at 9.35, 187 mm.; at 9.44, 175 mm. Observations of blood-pressure were discontinued on account of clogging of the mercury.

It will be observed that although this dog was anæsthetized while uncovered, he lost during the whole hour 2.8°, an average loss for a dog of this weight. The amputations were made about midway in the observation, and the three occupied in their completion but six and one-half minutes. There was no loss of blood, and the blood-pressure at the end of the observation, and about sixteen minutes after the completion of the last amputation, had gained 53 mm. If the blood-pressure may be taken in a degree as a measure of the condition of the animal during observation, this illustrates in a striking manner the benefit obtained by rapid operation without loss of blood.

EXPERIMENT XVII. This experiment was made upon a dog while covered, blood being withdrawn.

Dog 32. Long hair; weight, thirty-four pounds; anæsthetic, ether. Covered with cotton-wool at 9.30; no hot bottles used. Temperature at 9.06 P.M., before beginning the anæsthesia, was 102.2°; at 9.35, 102.7°; at 10.05, 102.9°; at 10.35, 103.3°; at 11.05, 103°. Anæsthesia stopped at 11.12; covering continued. Temperature at 11.45, 103°. At 10.24 eight ounces of blood were withdrawn. The blood-pressure at 9.45 was 103 mm.; at 10.20, 112 mm. Immediately after the withdrawal of blood at 10.25 the blood-pressure was 78 mm.; at 11.13, 52 mm.

In comparing Dog 32 with Dog 31 it will be seen that in Dog 32, when protected, the temperature rose under the anæsthesia. The withdrawal of blood was, however, accompanied by a loss of blood-pressure

amounting to 51 mm., or about one-half of the blood-pressure. When it is remembered that this accompanied the simple withdrawal of blood, whereas in Dog 31 the amputation of three legs took place, no blood being lost, it would seem to illustrate most forcibly the value of protecting the dog against hemorrhage.

EXPERIMENT XVIII. In this experiment the dog was covered, blood was withdrawn, and a stimulating enema administered.

Dog 33. Short hair; weight, twenty-three pounds; anæsthetic, ether; covered with cotton and a blanket, but no hot bottles. Anæsthesia was begun at 9 P.M. Temperature was not taken until 9.20, when it was 101.2°; at 9.50, 99.9°; at 10.20, 96.6°; at 10.57, 98.7°; at 11.20, 98.3°. Anæsthesia was stopped at 11.15. Temperature at 11.50, 99.2°. At 10.45 six and one-half ounces of blood were withdrawn. At 11 an enema of hot water, two ounces, and brandy, one ounce, was administered. The blood-pressure at 9.25 was 112 mm.; at 10.45, 108 mm.; at 10.50, five minutes after the withdrawal of blood, 88 mm.; at 10.53, 92 mm.; at 11, 81 mm.; at 11.15, 96 mm. A comparison of this dog with Dog 32, upon which the same experiment was performed, shows a greater loss in temperature. This may be accounted for in part by the fact that Dog 33 weighed twenty-three pounds, whereas Dog 32 weighed thirty-four pounds. The loss in blood-pressure in Dog 33 at the close of the experiment amounted to but 16 mm., as against 51 mm. in Dog 32. It is possible that the administration of alcohol at 11 P.M. may have been a factor in increasing the blood-pressure after the bleeding.

EXPERIMENT XIX. In this experiment the dog was covered and surrounded by hot bottles, and a leg was fractured and slowly amputated.

Dog 34. Hair was cut short; weight, fifteen pounds; anæsthetic, ether. At 9.15 P.M., just before anæsthesia, temperature was 102.2°. At 9.55 dog was covered with cotton-wadding and surrounded by hot bottles. At 9.47 the temperature was 98.5°; at 10.18, 97°; at 10.54, 96.6°; at 11.15, 96.2°. At 9.37 the hind-leg was fractured and slowly amputated, with some loss of blood. At 10.04 an enema of one ounce each of water and whiskey was administered. At 10.15, after the completion of the amputation, the dog stopped breathing and came near dying, but recovered with artificial respiration. Blood-pressure at 9.30 was 130 mm.; at 9.37, 132 mm.; at 9.40, just after the fracture, 106 mm.; at 9.55, 90 mm.; at 10, 98 mm.; at 10.10, 80 mm.; at 10.22, 89 mm.; at 10.30, 98.5 mm.; at 10.58, 100 mm.

It will be noticed in this experiment that the covering and hot bottles were not applied to the dog until forty minutes after the beginning of the anæsthesia. During this period the temperature had decreased 5.6°. After the dog was protected and surrounded by artificial heat the decrease in temperature was very slight. The effect of anæsthesia and operation upon this dog was most profound. The blood-pressure did not, however, decrease toward the end of this case, as in Dog 32, from which blood was withdrawn, but which had no stimulation by alcohol. When it is remembered that this dog weighed but fifteen pounds, it seems probable that the alcohol must have had an effect in preventing the loss of blood-pressure.

EXPERIMENT XX. In this experiment three legs were amputated, being constricted by rubber bands to prevent loss of blood. Later, blood was withdrawn. Unfortunately, my notes do not state whether the dog was covered or not. My memory is that the dog was covered

and surrounded by hot bottles; but if this were not true, the experiment is even more striking.

Dog 35. Long hair; weight, thirty-two pounds; anæsthetic, ether; covering uncertain. Temperature at 8.55 P.M., before anæsthesia, 102°. Temperature at 9.30, 100.2°; at 10.04, 101.9°; at 10.50, 101.6°. At 9.30 amputated hind-leg. At 9.35 one fore-leg was amputated. At 9.48 a second fore-leg was amputated. At 10.30 eight ounces of blood were withdrawn by loosening a rubber band. Blood-pressure at 9.28 was 130 mm.; at 9.35, 168 mm.; at 9.40, 116 mm.; at 9.48, 112 mm.; at 9.50, 118 mm.; at 10.29, 98 mm.; at 10.35, 54 mm.; at 10.37, 64 mm.; at 11, 75 mm. It will be seen that this dog lost in one hour and forty-five minutes but 0.4° in temperature, in spite of the fact that eight ounces of blood were withdrawn and three legs were amputated. The dog lost, however, in blood-pressure 55 mm. At the end of the amputations there was the greatest loss of blood-pressure, which amounted to 76 mm. The results in this dog are striking when compared with those in Dog 31. In Dog 31 three legs were amputated without loss of blood, the dog being uncovered. Dog 31 lost in fifty-seven minutes 2.8° of temperature; but in spite of the fact that three legs were rapidly amputated, all loss of blood being prevented, he gained in twenty-nine minutes from the time of the first observation 53 mm. in blood-pressure. Although Dog 31 was uncovered and there was some loss of temperature, he actually gained in blood-pressure. This would seem to demonstrate the benefits of rapid operation and the prevention of loss of blood.

In drawing any conclusions from the observations made in this paper I wish it to be distinctly understood that the experiments have been made from the standpoint of the clinician and not of the physiologist, and no pretence is made to physiological knowledge. It is hoped, however, that the observations may prove suggestive and perhaps aid in eliminating certain risks pertaining to surgical operations. The following conclusions would suggest themselves:

1. Dogs lose heat in marked degree under prolonged anæsthesia when produced in a room of ordinary temperature—*e. g.*, 65° to 75°.

2. This loss of heat may be prevented largely, if not entirely, by preventing the radiation of heat by carefully covering the animal.

3. The temperature may actually be increased under anæsthesia by covering the dog, and at the same time surrounding it with hot bottles. It is not intended to be understood that it is desirable to increase temperature during operations, but simply to show that this can be accomplished. This renders it certain that loss of temperature can be prevented by proper measures.

4. That these changes in temperature are due to anæsthesia seems evident from the following facts: *a*, that the changes in the temperature of dogs without anæsthesia were very slight; *b*, that the variations in temperature under anæsthesia bore a direct relation to the conditions under which the anæsthetic was administered, viz., whether the dog was uncovered or covered, and in addition was surrounded by hot bottles.

5. The tendency of the temperature after cessation of the anæsthesia was usually to return to normal, no matter whether it had been above or below that point.

6. Ergot and sulphate of atropia, while but little experimented with, served to retard somewhat the loss of heat under anæsthesia.

7. After stopping the administration of ether the heat which had been lost was quickly regained. After anæsthesia by chloroform and the A.-C.-E. mixture the temperature continued to fall for some time after the administration of the anæsthetic had ceased.

8. Observations upon blood-pressure seemed to show that the loss of pressure corresponded closely with the loss of heat.

9. Alcohol enemata, while aiding the recovery of blood-pressure, decreased the rapidity of the recovery of heat. The experiments were, however, too few to warrant the drawing of conclusions.

10. In a room having a high temperature, viz., 93° to 96°, the dog's temperature was increased very greatly under anæsthesia—*i. e.*, 4.6°. At the same time the blood-pressure decreased from 32 mm. The dog panted violently and was wet with perspiration, and seemed greatly exhausted at the close of the experiment.

This observation fairly raises the question, if operations under a high temperature are not exhausting to the patient as well as to the operator, and distinctly less advantageous than operations in a room of moderate temperature with the patient thoroughly protected.

11. Slow operations with loss of blood produced far greater loss of blood-pressure than operations of vastly greater magnitude performed quickly, care being taken to prevent loss of blood.

While care must be exercised in drawing conclusions from observations made upon dogs, these have confirmed me thoroughly in the belief that in prolonged operations patients should be carefully covered to prevent loss of heat, and that, if they have already lost heat from injury or exposure, the application of artificial heat is strongly indicated. The fact that dogs are covered with hair, and that their temperature is largely regulated through the respiratory tract, rather than the skin, would suggest the conclusion that if in dogs artificial covering and heat are desirable to prevent loss of heat, in human beings this is still more important. I believe also that the carelessness exhibited by many in loss of time during operations is most deleterious, and that operations performed with as much dispatch as is consistent with good work are decidedly to the advantage of the patient.

Further, care to prevent as much as possible the loss of blood is of great importance.

In conclusion, I have just a few words to say about observations made upon patients.

Since I have believed in the desirability of saving heat, time, and

blood in all serious operations, observations upon my own patients show little, unless it be that with care little loss of temperature occurs.

It is evidently impossible to measure blood-pressure upon patients as is done in dogs. There are, however, some observations of interest.

Eighty patients were observed as follows: the temperature was taken about 8 A.M., from one to two hours before the time of operation; it was taken again just before beginning the anæsthetic; and it was taken a third time just after the operation. The temperatures taken just before and just after the operations were rectal. In almost all cases there was a slight increase in temperature from the morning observation to that just preceding the operation. This averaged 0.4°. There was usually a loss of temperature during operation ranging from 0.2° to 2°. The loss of 2° was, however, very rare. The average was about 0.6°. In some cases there was no loss.

The operations were of all sorts, some being small operations; but the bulk of them were heavy operations, such as amputations of the breast, laparotomy, nephrectomy, suprapubic cystotomy, litholapaxy, removal of the appendix, cholecystotomy, etc. One observation upon a nervous patient was very interesting. Her temperature at 8 A.M. was 99.2°; about one and one-half hours later, just before the operation, it was 104.4°. After the removal of an ovarian cyst, the operation being exceedingly difficult and lasting one hour and five minutes, the temperature was 100.2°. Thus, before operation there was in a short time an increase of temperature of 5.2°, this increase being, so far as I could determine, a nervous phenomenon. These observations upon patients, showing, as they do, so little loss of temperature, seem to me to show that with care in operating a distinct source of depression may be avoided. While few will, I believe, question this conclusion, as was said in the beginning of this paper, an extended observation has impressed upon me the belief that many operators do not fully realize the importance of protecting their patients during operation from loss of temperature, loss of blood, and loss of time.

CONGENITAL ABSENCE OF UTERUS AND VAGINA.

PLASTIC OPERATION FOR ARTIFICIAL VAGINA, TAKING FLAPS FROM NYMPHÆ AND PERINEUM.

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M. A., aged nineteen years and single, a native of Gloucester, Mass., was sent to me by Dr. G. N. Jones, of that city, February 14, 1894. She gave the following history:

Her father was born in Sweden and her mother in Nova Scotia, the latter having died of cancer of the uterus six years before. With this exception the family history was negative. Of her three sisters, one was married and had a child; another, sixteen years old, had menstruated regularly for four years; and the third, then fourteen years old, had not at that time had her catamenia established, but has since menstruated regularly.

The patient had never been in rugged health. She had suffered with a purulent discharge from the left ear ever since one year of age, and she had measles and chickenpox at seven to eight years of age. She had been under medical treatment for the preceding four years for general weakness, headache, weak eyes (for which she had been wearing glasses with benefit), temporal headaches, sore-throat, loss of appetite, and shortness of breath. While under treatment she had improved, and at the time of my first consultation she had a fair appetite and digestion, and her chief complaints were a weak back and the fact that she did not menstruate. As she was engaged to be married, the last fact was of especial importance to her. There had been no menstrual molimen whatever.

Physical examination showed a well-developed, rather poorly nourished woman above the average in height, of light complexion, the hair of the head long and thick, voice feminine, breasts each having a well-developed gland with a few follicles showing in the areolæ about the inverted nipples, hips large, and pelvis of female type.

Genital Organs. An abundant growth of hair on the mons and the outer surface of the labia majora. Labia majora, labia minora, vestibule, and clitoris well developed. Meatus urinarius and urethra of large calibre, taking a sound fourteen millimetres in diameter without much stretching; natural diameter about eleven millimetres. Hymen absent. Where the introitus vaginæ is normally situated the mucous membrane was redundant and wrinkled, and in the centre was the opening of a small pocket four millimetres in diameter. This pocket had a depth of one and one-half centimetres, its long axis corresponding with the axis of the normal vagina, and it was apparently lined with mucous membrane. A small amount of milky-white secretion could be expressed from it. Orifices of vulvo-vaginal glands large and normally placed. In other words, with the single exception that the introitus vaginæ and hymen were absent, the external genitals were normal.

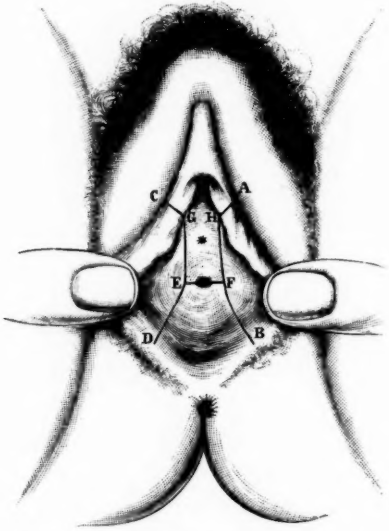
As a bimanual examination with a finger in the rectum failed to reveal the presence of the uterus or other internal organs of generation the patient was sent to St. Elizabeth's Hospital, where an ether examination was made on the following day. Two of my colleagues on the gynecological staff of the hospital kindly saw the case with me. We all examined bimanually with the forefinger in the rectum, also with the little finger in the bladder. Then with a sound in the bladder and a finger in the rectum and with the sound in the bladder and a hand on the abdomen. The abdominal walls were thin and lax, and the intestines undistended, and, the rectum and bladder being empty, all the conditions for practising the touch were most favorable. No uterus, ovaries, or tubes, or any thickened tissues that might represent any of these organs, or the occluded vagina, were to be felt in the pelvis. The bladder and rectum seemed to be of normal size, shape, and situation. The septum between the bladder and rectum was thin.

The patient was advised to consult an aurist for treatment of the chronic inflammation of her ear, and also to see the ophthalmologist again. The condition of her genital organs was explained to her and to her married sister, and they were advised to inform her *fiancé*. She was told that if she wished to undergo an operation that possibly a serviceable vagina could be made.

After giving the matter careful consideration she decided to have the operation performed, and accordingly entered the hospital for that purpose.

Operation, March 28, 1894. The object of the operation was to separate the bladder from the rectum by incising the cellular tissue between these organs, and then to cover the raw surfaces forming the walls of the cavity so made with mucous membrane or skin, utilizing three flaps; one taken from the fourchette and perineum and one from each of the labia minora.

FIG. 1.



AHF and CGE. Lines of incision for flaps from labia minora.
ED and FB. Lines of incision for perineal flaps.
EF. Line of incision for excavation for new vagina.

After ether had been administered and the usual antiseptic precautions observed, the vulvar hair was shaved and the rectum thoroughly irrigated with corrosive. An attempt has been made in Fig. 1 to show the relation of the parts. The orifice of the rudimentary vagina is shown on line EF. An incision was made along this line and prolonged at each end so that it measured about three centimetres in length, splitting the rudimentary vagina into halves. With a finger in the rectum and a sound in the urethra for guides, the recto-urethral septum was split by dissecting with the scissors and finger for a distance of five

centimetres. At that point the finger in the wound was apparently separated from the intestines by a sheet of peritoneum only, and, practising the bimanual touch again, it was impossible to discover the presence of any tissue that might represent the uterus, ovaries, or tubes.

In order to cover the raw surfaces formed by the dissection, flaps were formed as follows: the nymphæ were cut off at AH and CG, and then incisions through the mucous membrane made along the lines HFB and GED. The two lateral flaps formed in this way were dissected free, and by so doing the nymphæ were split from their posterior aspect and unfolded, as it were.

The posterior flap, represented by the surface enclosed in the letters DEFB, was formed by dissecting deeply the tissues of the fourchette and perineum, so that this flap could be dragged upward and inward to cover the posterior surface of the new vagina. The strip of mucous membrane on this posterior wall that had been half of the rudimentary vagina was dissected away, and the posterior flap anchored by suturing its tip at the uppermost part of the new vagina with a catgut stitch. In the same manner the two lateral flaps were disposed of by stitching their tips at the apex of the vagina. The little strip of mucous membrane on the anterior wall from the rudimentary vagina was utilized by stitching the lateral flaps to its edges. The operation was completed by sewing together the edges of the mucous membrane at the stumps of the nymphæ and at the places where the three flaps came into apposition with fine interrupted sutures of catgut.

At the close of the operation there was a small raw surface, about one centimetre in diameter, at the highest part of the wound, that it was impossible to cover. The vagina was packed lightly with iodoform-gauze and the patient put to bed.

The after-treatment consisted in keeping the vagina packed with iodoform-gauze. The left flap broke loose on the third day, but by carefully applied pressure it glued on again. A glass-tube that was introduced as a dilator was not well tolerated, so the house-surgeon manufactured a dilator out of a rubber finger-cot stuffed with cotton. This was worn constantly, being kept in place by a T-bandage. On May 1st the vagina measured two and one-half centimetres in diameter and four and one-half centimetres in depth. The patient left the hospital on May 3d, with instructions to wear the dilator for a month.

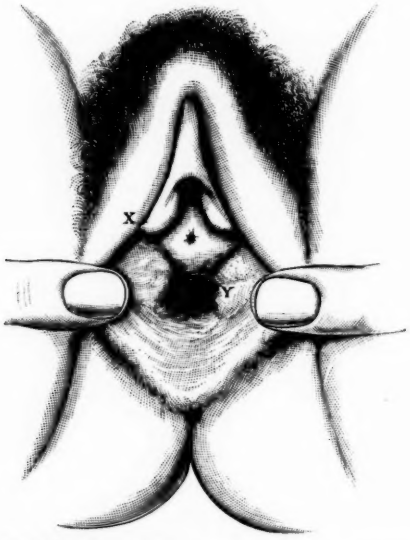
She was not seen again until two years later, February 29, 1896, when she appeared at my office with her husband. She reported that she had gained very much in health and had been perfectly well, with the exception of weakness of the back after exertion and of a recent attack of indigestion; that she had then been married two months and a half; that she had had sexual intercourse regularly since marriage, and that the intercourse was attended by sexual feelings and gratification. Her husband also said that, for his part, coition had been entirely satisfactory.

She now called my attention for the first time to a bunch in the right side of her abdomen, which she had first noticed, she said, several years ago—in fact, before the operation; but, as it had never given her any discomfort, she had not spoken of its presence. It had moved lower down in the abdomen since the operation, and since her marriage had increased in size. Examination showed a tumor the size and shape of a large kidney situated in the false pelvis on the right side, the hilus

being toward the vertebral column. Its upper border, with the patient on her back, was on a line drawn from the umbilicus to the right anterior superior spine of the ilium. It slipped from under the hand in the manner characteristic of movable kidney, its mobility being limited above just beyond the level of the umbilicus, on the left at the median line, and below at Poupart's ligament. Pressure on the tumor caused "a sickening sensation." Palpation in the right flank failed to detect the presence of the kidney in its normal situation. The urine was normal. It had been increased in amount, of late, she said. There had been no pain or dragging sensation in the region of the tumor.

The tumor was surely not in its present situation at the time of the ether examination two years before, or it would have been felt at once by the examining hand on the abdomen. Bimanual examination with a finger in the vagina and with a finger in the rectum showed that the tumor had no pelvic connections that could be felt, and confirmed the previous diagnosis of absence of the uterus.

FIG. 2.



X. Stump of right labium minus.
Y. Wrinkled and brown mucous membrane to the left of introitus vaginæ.

The patient's general appearance bore out her statement regarding her health, for she had apparently gained in flesh and certainly looked the picture of health. Fig. 2 is a representation of the external genitals at this time. The letter X is on the stump of the left nympha, and Y is placed just to the left of the opening of the vagina. About the opening there were several areas of pigmented mucous membrane, or more properly skin, as representing the outer surface of the nymphæ. The vagina measured three centimetres in diameter when dilated and

five and one-half centimetres in depth. It was distensible, not sensitive, well lubricated, and when examined with the speculum appeared to be lined throughout with mucous membrane.

December 9, 1896, the patient wrote that she had adopted a four months old baby, and was very happy in its care.

The first operations for the formation of an artificial vagina were done by R. Fletcher in 1831[1] and Amussat in 1832,[2] and were performed for the purpose of allowing the escape of retained menses. The operations were blunt dissections in the recto-vesical septum, were performed in many stages lasting several days, and had for their object gradual drainage through a small opening. Emmet perfected the present accepted operation of rapid evacuation of the retained fluid by a dissection of the tissues between the bladder and rectum, making a free opening and then packing the wound with gauze or a glass-plug and allowing it to cicatrize. The manifest disadvantage of such an operation is that in the course of time the newly formed vagina becomes entirely occluded by cicatrization. That this is a fact is abundantly shown by the large number of reported cases.

Credé, in 1883,[3] formed a new vagina by using one large skin-flap from one of the labia majora. Baudry[31] followed Credé's method, but obtained a poor result due to sloughing of the flap. L. Picqué[4] created a new vagina in a case of infantile uterus and absent vagina by taking flaps from the anterior wall of the vestibule and from the perineum. He obtained a vagina five centimetres long two months after the operation. He later reported a similar case done by Villar, of Bordeaux. Von Swiecicki[5] reports a case of absence of the vagina resulting from gangrene following labor in which he performed a successful plastic operation by using rabbit's intestine. Kustner[29] proposed to divide the labia minora at their inner surfaces, unfold them as in my case by dissection, unite their edges, and push the bag so formed into the excavation for the vagina. Finding this procedure impracticable, he used grafts of human intestinal mucous membrane obtained from a recent case of intestinal resection for perforating wound of the abdomen, and obtained a good result.

Mackenrodt[30] has recently made use of grafts of vaginal mucous membrane obtained from a case of prolapse to cover the raw surfaces of an excavation for a new vagina.

Schwartz[28] made a vagina by the use of four strips of mucous membrane, two lateral, one anterior, and one posterior. He got union by first intention, and eighteen months after there was a cavity five centimetres deep.

The only other cases of plastic operation for artificial vagina that I have found in literature are one by Rosciszewski, and published in Krakow in 1894; the title is "Plastic Vagina by Means of Flaps of

the Labium Prudendi, in Stenosis of the Vagina ;" and lastly, operations very like mine, by Christian Fenger, of Chicago, in 1886,[6] and Roux[32] in 1891.

In Fenger's case the patient had been operated on a year previously by Byford, for retained menses, but the vagina having cicatrized she had a return of her symptoms. Fenger made two preliminary operations two weeks apart to dilate and keep open the vagina with a plug, and two and one-half months later he performed the plastic operation. The portions of the labia minora used measured each one square inch. The labia were cut off from above and the flaps twisted on their bases as well as being split and unfolded, as in my case. He found it unnecessary to take a flap from the perineum. The subsequent course was uninterruptedly aseptic, and the result was a vagina lined throughout with mucous membrane of some secretory power. Roux used two flaps taken from the nymphæ, unfolding them and stitching them in the excavation, and got a good vagina six to seven centimetres deep.

The advantages of a plastic operation for artificial vagina over the plug operation are obvious both in cases of congenital and acquired absence of the vagina. Where the labia minora are of sufficient size they seem to me to offer the most available means of covering the walls of a new vagina, as entailing less mutilation than would be the case with flaps taken from the labia majora or vestibule, and I should agree with Fenger that a bilateral operation is preferable to a unilateral one.

In considering the question of absence of the uterus it may be stated at the outset, without fear of contradiction, that complete absence of the uterus has been demonstrated by anatomical proof only in cases of acephalic monsters or fœtuses with spina bifida or other malformations incompatible with prolonged life. In all other cases a small bit of tissue, a knob of muscle or band of connective tissue, if nothing more, as representing rudiments of the uterus, has been shown to exist on the cadaver.

From a clinical point of view, a woman possessing such rudiments is as badly off as if she had no uterus at all. I maintain that a small piece of muscle without the shape of a uterus, or a band of connective tissue across the pelvis, cannot be called a uterus either in an anatomical or physiological sense, and such a state of affairs is of interest only from the standpoint of embryology ; therefore we are justified in speaking of women possessing such rudimentary structures as cases of absence of the uterus. The case just reported is an example of a not very rare class—*i. e.*, normal feminine habitus, well-formed hips, breasts, and external genitals, hair of the head long, normal pubic and axillary hair, and feminine voice, with absence of the uterus and more or less atresia of the vagina. These individuals are usually healthy unless the ovaries

are present and functionally active, in which case they suffer from menstrual pains, sometimes so severe as to necessitate oöphorectomy.

Absence of the uterus was first noted by the anatomist Realdus Columbus, in 1572.[7] According to Kussmaul, his observation was defective, and the complete absence of the uterus was not satisfactorily demonstrated. In the succeeding two hundred years the only observations on this subject were made by Morgagni, Morand, and Seron, and they were incomplete. In 1777 William Hill, of Hillsborough,[8] reported an incomplete case of absence of the uterus. He made an autopsy on a woman forty years old who had neither uterus, ovaries, tubes, broad ligaments, nor vagina, but in their place a "cylinder" three inches long and one inch thick. In 1781 Engel[9] published a dissertation on the total or partial absence of the uterus. He first called attention to the rectal touch and catheterism of the bladder as a means of diagnosis, besides studying the anatomy of the subject.

From the beginning of the nineteenth century the reports of cases of absence of the uterus were published with increasing frequency and with greater accuracy of observation. Kussmaul, of Heidelberg, was among the first to publish an extended treatise on the subject and to attempt to explain such anomalies from the standpoint of arrest of development. This treatise, [10]published in 1859, is today the standard work on the subject. Kussmaul investigated the question from an anatomical and embryological point of view, and concluded that absence of the uterus could not be demonstrated with surety on the living woman and that most of the reported cases were really cases of rudimentary uterus; that pathologically there was always some rudimentary tissue to represent the uterus. Many cases of absence of the uterus have been reported in medical literature since Kussmaul's time. The names of Le Fort,[11] who introduced Kussmaul's ideas into France, and L. Fürst,[12] who contributed much to the exact understanding of the embryonic period which corresponded to each of the anomalies, should be especially mentioned in this connection. One of the most recent and complete epitomes of the subject is the graduation thesis of Francis Rossignol,[13] published in 1890.

To get some idea of the frequency of this anomaly I have made a careful study of the literature, using the *Index Medicus*, the Gynecological Index in the early numbers of the American Gynecological Society's *Transactions*, and the *Index Catalogue* of the Surgeon-General's office.

Without aiming at absolute completeness, owing to the inaccessibility of some of the sources of information, I have been able to collect the references to 360 cases of absence of the uterus reported by 239 authors from earliest times up to the present. Roughly, we may say about 300 cases in the last century. Cases occur in the literature of all civilized

countries. I have examined a majority of the 239 references, and have found among them the records of only thirty-five autopsies where this condition was present. Of these, twenty-four were on the bodies of adults and two on girls ten and twelve years old respectively, the rest being on monstrosities and fœtuses with absence of other organs, making prolonged life impossible. In all of the autopsies on the bodies of adults and girls there were noted in every case rudimentary tissues representing the uterus, generally one or two little knobs of tissue the size of hazelnuts or a thin band between the bladder and the rectum.

The ovaries were found to be present in all the cases but six, and five of these were reported in general terms without details, such as "Internal organs of generation wanting." The six cases referred to as having no ovaries were: 1. Case of William Hill, of Hillsborough,[14] already cited. 2. Busch[15] reported a case which Kussmaul thought might be an hermaphrodite. The statement was made that at the autopsy vagina, tubes, uterus, and ovaries were completely wanting. The patient was eighteen years old. 3. Otto[16] reported an autopsy on a twelve-year-old girl who died of a "blue sickness" as the result of grave cardiac malformations. The external genitals were normal, the vagina was very short and terminated in a cul-de-sac, and the internal genital organs were totally wanting. 4. Mary Putnam Jacobi[17] cites a case reported by Hanff where he performed an autopsy on a woman aged fifty-one years who had died of smallpox. The ovaries and tubes were entirely wanting and the uterus was rudimentary. The external genitals were small and undeveloped, like those of a ten-year-old girl. Sometimes the ovaries were found atrophied and sometimes misplaced, but always present except in the foregoing instances. 5 and 6. Lieutaud and Richerand[27] dissected subjects in whom neither the uterus nor its annexed organs were found.

The tubes were present in all cases except six, though often without any canal. The six cases were those of Otto, Busch, and Hanff, and one reported by Boyd.[18] He records the result of an autopsy on an inmate of a workhouse, aged seventy-two years. There was malposition of the kidneys, and the tubes and uterus were wanting, the vagina being represented by a cul-de-sac half an inch deep. The right ovary was normal and the left converted into a fibrous mass. The external genital organs were normal. Also cases reported by Blasius[25] and Blot.[26]

A very large proportion of the reports I have examined are of cases similar to mine—*i. e.*, adult women, feminine habitus, normal external genitals and breasts. A very few cases having abnormal external genitals and the male type of breast, with absence of pubic hair, are reported. The vagina was generally present as a short pouch, though often entirely wanting. Absence of the vagina alone, the uterus being present, is a much more common anomaly than absence of the uterus.

The literature is teeming with published cases of retained menses both from absent vagina and from imperforation of the lower part of the vagina, commonly spoken of as imperforate hymen. So, also, the other developmental defects—double vagina, double uterus, and bicorned uterus—are more common.

In a considerable number of the cases of absent uterus and vagina the urethra has been found to be of large calibre, and in several cases coitus has been practised through it, often without the knowledge of the patient that anything was wrong in this respect. Emmet's case[19] of this sort was one of the earliest and most widely quoted. Most writers hold that the large calibre of the urethra in these cases is due to attempts at coitus, but in view of the fact that there are on record many cases of absence of the vagina in unmarried women of good character where the urethra has been found large—*e. g.*, my case above reported—it seems that the explanation is to be sought rather in some developmental defect. Mary Putnam Jacobi[20] thinks that the large size of the canal extending from the bladder to the vestibule is due to the fact that it is constituted by a persistent embryonic organ, the urogenital sinus, and is not simply the urethra.

The anomaly of absence of the uterus is due to a lack of fusion and subsequent atrophy of the ducts of Müller, a process which ordinarily takes place at the end of the third month of fœtal life. It is well established that these ducts, under normal conditions, fuse in their middle and lower course, the process proceeding from above downward to form the uterus and vagina, whereas above the separate non-fused ducts form the Fallopian tubes. The external genitals, the lower part of the vagina, as well as the urethra and vesical trigone, on the other hand, are formed from the urogenital sinus, and the genital tubercle, furrow, and fold. It is therefore plain why the external genitals are so often found in a normal condition in the same individual in whom the internal organs are wanting or rudimentary, since they are formed from a different set of embryonic tissues. We see also why the vagina is apt to be wanting when the uterus is wanting. A partial coalescence of the Müllerian ducts accounts for the reported cases of double vagina and double and bicorned uterus. The ovaries are in close relation to the kidneys in fœtal life, the kidney being situated much lower down than in the adult. Cases are on record where the ovaries have been found malposed and in their fœtal relation. I have found a considerable number of recorded cases where absence of the uterus was associated with misplaced kidneys. Werth has also noted this association of the two conditions.

The derivation of the hymen is still in dispute. It was formerly held to be formed from the lower end of the vagina, but the many cases of absence of the uterus and vagina where a well-formed hymen exists

would seem to disprove this view. So, also, the absence of smooth muscular fibres in the hymen would tend to show its anatomical dissimilarity to the vagina. Pozzi[21] holds that the hymen is developed entirely distinct from the vagina and is derived from the urogenital sinus. He accounts for the prolongation of the rugæ and pillars of the vagina on to its posterior aspect as a later developmental change. He thinks that complete atresia of the hymen is generally due to a terminal imperforation of the vagina. It is known that the hymen develops late in fœtal life, the nineteenth week, and there seems every reason to believe that it is formed from the same embryonic structure as the vestibular vagina—*i. e.*, the urogenital sinus. Therefore, we should not expect to determine whether it would be likely to be present in any given case of absence of the vagina. As a matter of fact, it is reported as present in a majority of cases, as is also some sort of a vaginal canal. This canal must be thought of as a persistent urogenital sinus rather than a Müllerian vagina, because in the process of development the Müllerian ducts coalesce from above downward. The urogenital sinus develops from below—the urethra and rectum being set off from the vagina—and it is not difficult to understand how, in one case, the lower vagina fails to develop, giving rise to hæmatocolpus if the uterus is functionally active, or, in another case, the uterus and Müllerian vagina being absent, that the urogenital sinus forms a urethra of large calibre and a hymen.

It would seem as if inheritance had something to do with absence of the uterus. Squarey[22] reported the cases of three sisters who had never menstruated, three of whose aunts were sterile. Phillips[23] speaks of two sisters, both married, with congenital absence of the uterus. Nelson[23] reported absence of the uterus in three of a family of five sisters. All three had sexual desires. Of the two sisters with uteri, one had a family of four children, the other was seventeen years old and unmarried. Sexual appetite was present in most of the cases reported. Menstrual molimina sometimes and sometimes not, but generally present where the ovaries could be diagnosticated.

It is seldom that a proper diagnosis can be made without an anæsthetic. The thinness and condition of laxity of the abdominal walls are important factors in determining the accuracy of the examination. In some of the reported cases the diagnosis was confirmed by operation, as in several where oöphorectomy was practised for severe menstrual pains. A diagnosis made in this way is not so likely to be accurate as one made post-mortem, when there is an abundance of time for examination. On account of the large urethra in these cases it is usually an easy matter to introduce a finger into the bladder, thus facilitating the diagnosis.

As to treatment: if there are no molimina, it is a question for the

patient to decide whether she will have an operation or not. It has been maintained by a majority of writers that it is unjustifiable to operate on the unfortunate woman who has no uterus and no vagina. Certainly in my case the patient and her husband were rendered happy by the result of an operation. If we are able to form a vagina that will not close by cicatrization, it seems to me that operation is much more justifiable than it is in cases where the only operative procedure is to make an opening and try to keep it from closing by a plug or packing.

Emmet[21] has reported two cases in which the patient's health became established following operation for artificial vagina, and he quotes Robert Barnes as having noted the same remarkable circumstance.

Where menstrual molimina are severe, oöphorectomy is undoubtedly indicated.

Bibliography.

1. Lancet, August 13, 1831.
2. Gaz. médicale de Paris, 1835 2 S., iii. 785.
3. Archiv für Gynäkol., 1883, Bd. 22, H. 2, S. 229.
4. Rev. de chirurgie, Paris, November 10, 1889, ix. 948.
5. Archiv de tocologie et de gynéc., 1892, xix. 481–485.
6. Trans. Amer. Surg. Assoc., 1887, v. 375–383.
7. De re Anatomica, Libri xv., 1572, 8, 495.
8. Diss. de Utero deficiente, 1777.
9. Diss. de Utero deficiente, Regiom., 1781.
10. Von dem Mangel der Verkümmerung und Verdopplung der Gebärmutter, 1859.
11. Des Vices de Conformat. de l'Utér., etc., Paris. Thesis, 1863.
12. Monatsschrift für Geburtshülfe, xxix. and xxx. 1867.
13. De l'Absence ou De l'état rudimentaire de l'utérus, Paris, 1890.
14. Loc. cit.
15. Rust's Magazine, xii. 330.
16. Seltene Beobachtungen zur Anat., Physiol. u. Patholog., 2 S., 1824.
17. Amer. Journ. Obstet., xxxii. 520.
18. Medico-Chirurg. Trans., xxiv. 187; also Lancet, 1840–1841, 884.
19. Vesico-vaginal Fistula from Parturition and Other Causes, 229.
20. Loc. cit., 512.
21. Clinical and Operative Gynecol., ii. 466, 467.
22. Obstet. Trans., London, xiv. 212.
23. Amer. Med. Monthly, 1861, xv. 426.
24. Principles and Practice of Gynecology, 1884, 189.
25. Observationes Medicæ Rariores, 1677.
26. Compt. rend. Soc. de Biol., iii. 176. Paris, 1857.
27. Dictionnaire des Sciences Médicales.
28. La Semaine Médicale, 1892, 161.
29. Verhandl. der D. Gesellsch. f. Gynäkol., 1893.
30. La Semaine Médicale, 1896, 28, 110.
31. Bull. de la Société d'Anatomie de Bordeaux, 1889.
32. C. R. du Congr. franc. de Chir., 1891, 497.
33. British Med. Journal, 1870.

REVIEWS.

TREATISE ON SURGERY. By American Authors. Edited by ROSWELL PARK, A.M., M.D. Vol. I. General Surgery. Vol. II. Special or Regional Surgery. Philadelphia and New York: Lea Brothers & Co., 1896.

THE reader who opens these volumes is immediately struck with a difference between them and other American and English works on general surgery. It is evident that Dr. Park has endeavored to produce a treatise similar in form to those found in German surgical literature. This is partly done by the use of two sizes of type, which enables the reader to distinguish at a glance the relative importance of the statements, and partly by the incorporation of much material that in American and English works is apt to be omitted; probably on the ground that it is not sufficiently "practical."

The result of this action of the editor has been to give the profession a work of moderate bulk which can satisfactorily be used by the student, and yet serve the surgical specialist as an almost encyclopædic work of reference.

If the articles were all written with the painstaking care and scientific grasp that are exhibited in the chapters on Surgical Pathology and most of the chapters on Surgical Diseases, the book would be an ideal one. This statement is not intended to convey the impression that the rest of the volume is unusually poor; but that the portions indicated are unusually good and of commanding importance.

The aim of the editor to bring the average surgical mind to accept the truth that surgical progress and success are impossible without a knowledge of modern pathology, human and comparative, and of embryology, is clearly demonstrated. It is noticeable, however, that all of the contributors have not been imbued with this spirit, for in some of the chapters there is evidence of either hasty preparation or unfamiliarity with modern pathology and modern surgical practice. This mars the work. The chapters on Shock, Aneurism, and Fractures are good examples of this defect. Let the reader contrast these chapters with the fine dissertations contained in the chapters on Surgical Pathology of the Blood, Diseases Common to Man and the Domestic Animals, Process of Repair, Osteomyelitis, Surgery of the Abdomen, and Hernia, and the statement of the reviewer will be confirmed.

Such irregularities seem inseparable in composite text-books, whether the respective articles be signed by the authors or not, unless the editor exerts the power and takes the time to revise thoroughly every paragraph.

The proportionate authorship of the volumes conveys the impression that the editor perhaps intended to write the whole treatise himself, but, finding the task a great one, concluded to ask the assistance of collab-

orators. He has supplied but three articles in the second volume, while of the first sixteen chapters of the first volume he has written fourteen. It is especially in these articles by the editor that the German method of book-making is conspicuous. The English-speaking profession owes him a debt for bringing so forcibly to its eyes, by contrast, the usual deficiencies of surgical treatises written in English.

The typographical appearance of the book is rather bizarre, because of the excessive frequency with which italics are employed. Clear statements and good rhetoric are usually to be preferred to this eye-catching device, which loses its power by repetition. The illustrations are very uneven in quality; some are extraordinarily good and illustrative; others give no aid to the text and are distinctly undesirable in volumes emanating from a publishing-house of such renown.

The list of contributors contains the names of Park, Belfield, Parmenter, Souchon, Nancrede, Burrell, Gerrish, Eve, Ransohoff, Mudd, Bradford, Dennis, Gerster, Kelsey, Lovett, Matas, Richardson, Bevan, Fordyce, Holloway, C. F. Smith, Parker, C. S. Bull, Etheridge, Delavan, Hardaway, and Blake. Many of these writers are so well known that their statements will be accepted as of high authority.

The sections devoted to the diseases of special organs, such as the eye, ear, and skin, have been written by recognized specialists, who have condensed the material at their command so as to make the articles suitable for admission to a text-book of surgery. The preparation of the section on Anæsthesia has been intrusted to a distinguished writer on therapeutics. This is the plan followed in Dennis's *System of Surgery*, recently issued by the same publishers. The result has been the incorporation in both works of much important information on the physiological action of anæsthetics, of which surgeons as a class are ignorant. In the treatise under consideration it seems, however, as if there was an absence of that definite instruction in the application of drugs to general and local anæsthesia which the student and practitioner of limited experience need. A similar criticism has been made, if the present writer remembers aright, in regard to Dennis's *Surgery*.

It is unusual for two such important works as Park's *Surgery* and Dennis's *Surgery* to be issued by one medical publishing-firm within a few months. Comparison will, therefore, undoubtedly be instituted, and surgical readers will probably gain much by referring to the corresponding chapters in both works. The true value of statements will be thus obtained, since in most instances the writers are not the same. A considerable number of the contributors appear in both works, but only in two or three instances has one author written on the same topic. Some of the plates in Park's *Surgery* are the same as in Dennis's *Surgery;* and in several instances the writers acknowledge their indebtedness for tables and other material to the latter, which is much the larger, as it was also the prior, publication.

The two works are in a way supplementary to each other, and are both necessary to the library of the surgical specialist. Park's *Treatise*, however, will be found comprehensive enough for consultation under most circumstances, and has an individuality so different from other surgical treatises in the English language that it is destined to become very popular. This popularity will be increased by the fact that the purchaser may buy either volume separately, and is not compelled to spend at one time the large sum required to purchase the four volumes

edited by Dennis. The first volume will aid the sale of the second; since it is, the reviewer believes, the more valuable. Would that the truly satisfactory sections in both works had been combined in one publication! Then the American profession would have had the honor of producing a surgery of unrivalled value. J. B. R.

THE PRACTICE OF MEDICINE. A TEXT-BOOK FOR PRACTITIONERS AND STUDENTS, WITH SPECIAL REFERENCE TO DIAGNOSIS AND TREATMENT. By JAMES TYSON, M.D., Professor of Clinical Medicine in the University of Pennsylvania, and Physician to the Hospital of the University; Physician to the Philadelphia Hospital; Fellow of the College of Physicians of Philadelphia; Member of the Association of American Physicians, etc. Philadelphia: P. Blakiston, Son & Co., 1896.

AFTER a third of a century spent in the assiduous study, practice, and teaching of medicine, and the publication of successful books on various topics, theoretical and practical, the writing of a text-book is not only a proper ambition, but is really expected by students and the profession. So Professor Tyson best shows his modesty by making no apology for the present work. Nor is the work unworthy of the author. Externally, it is the largest and handsomest single volume on the practice of medicine now before the profession. The paper is opaque and not too glossy; the type is clear; "bold-face" and italics aid the eye. The arrangement of subjects follows the common usage, infectious diseases beginning, the various other divisions following, though in an order somewhat arbitrary. Thus, "constitutional diseases" are placed between diseases of the suprarenal capsule and those of the nervous system. Acute articular rheumatism is placed among constitutional diseases, with a foot-note in regard to the probability that it is an infectious disease. Croupous pneumonia is under the diseases of the lungs. No doubt, in a text-book this is most satisfactory. Etiology as transformed by bacteriological discoveries is most conveniently studied along with general pathology. At the same time it would seem well for a text-book on practice to give at least a brief general account of pneumococcus-infection. A section on the symptoms and treatment of poisoning, a table of minimum fatal doses and of maximum doses followed by recovery, and tables of weights and measures, add to the practical value of the book. Matters of diagnostic technique are described in connection with some diseases, as those of the stomach and nervous system. There is a description of the mediastinum, with figures showing the anatomical relations, and an account of the neuron doctrine. In nomenclature convenience has been consulted. Phthisis is used in its common meaning; the classification of kidney diseases is the simplest. An innovation of which we do not see the value consists in placing together hemorrhagic infarction of the lung and septic pneumonia, under the head of Embolic Pneumonia. The various diseases are given space, as a rule, with great justice. In one respect it may be thought Dr. Tyson was too impartial, for the subject of kidney diseases, in which he has long been an expert, might have been treated more fully, even if some other section had to be reduced.

Coming to a more detailed consideration of the text we find much to admire. Medical definitions are difficult, but are of undoubted assistance to beginners, and Dr. Tyson is to be congratulated on the large number he has made, almost every disease being furnished with one. We are surprised that the definition of typhoid fever does not include some mention of the clinical features. The numerous brief historical notes are admirable.

The remarks on etiology are, as a rule, accurate. The mention of Elsner's method for the diagnosis of the typhoid bacillus shows the difficulty of making a book up-to-date on such matters. By the time this book was printed Elsner's method was known to be not so valuable as was at one time hoped. Before the book reached our hands another method for the diagnosis of typhoid fever—Widal's—superior for clinical purposes to that of Elsner's, was being carried out as a routine measure by boards of health in towns the names of which Widal probably never heard and certainly could not pronounce. The important investigations in the etiology of cerebro-spinal meningitis also came too late to be used. Such things are unavoidable. Where information was available Dr. Tyson has used it.

In pathology and pathological anatomy it seems to us the author has limited his space too much. Of course, there are many who do not care for such matters, but it seems as if a little more could have been given with advantage. So, for example, a more minute description of the lesions of typhoid fever and pneumonia, a more detailed account of the causes of bronchitis, and a reference to the ovarian theory of osteomalacia would be welcome.

Clinical features are usually described in a masterly way. In pointing out, as we shall proceed to do, some points on which we differ from the author, it will be seen that the things we criticise are comparatively trifling, and we call attention to them in no captious spirit, but because they are in striking contrast to the rest of the work.

Dr. Tyson applies the term "strawberry tongue" to the condition in scarlet fever in which "the tongue is red at the edges and tip, furred at the centre, but through the fur stand the papillæ in distinct points." Dr. Tyson is in good company here, but the application of the term hardly seems rational. The changes on the tongue, however, are correctly described. The symptoms of ascites as described are said to require seven to ten litres of fluid for their development. Would it not be well to mention more fully the possibility and method of recognizing, sometimes, much smaller quantities? The statement that the "'ovarian cell,' when present in large numbers, is certainly a help to the identification of ovarian fluids" would be more useful if we had a clearer description and a less equivocal picture of the cell and some idea of what is meant by "large numbers." We thought Dr. W. A. Edwards had given the once much-talked-of "ovarian cell" the *coup de grâce*. Dr. Tyson says the sputum in croupous pneumonia is "tenacious, dark red in hue—'prune-juice.'" And again, "the term prune-juice has long been applied to the expectoration of croupous pneumonia, and sometimes when it is thin and dark-hued the comparison is an apt one." This assures us that the preceding statement involves a slip of the pen. Prune-juice is a poor object for comparison, but at all events is not tenacious, so that the first statement should read "light red or yellow—rusty;" the common term "rusty" not being mentioned. No reference

is made to the peculiarities of cases with "prune-juice" sputum. The statement that vocal fremitus is "invariably increased" in pneumonia leaves out of sight the rare cases of massive pneumonia, and the cases with temporary or permanent absence of fremitus from a mucous plug or weak voice, so puzzling to beginners. The description of tuberculous peritonitis is not so full as it should be, in view of the frequency with which that disease is mistaken in practice. We are surprised to find no mention of auscultatory percussion as applied especially to the stomach. Deceptive in some cases, it is, on the whole, a most useful method. Spinal puncture in suspected meningitis is also not mentioned. Bacteriological examinations of pleural exudates, and their prognostic and therapeutic value, seem to deserve some notice.

The subject of treatment is given unusual space, and in many respects is the best part of the book. The directions are full and clear, and, as a rule, eminently judicious and conservative. The author has his fads, but they are old ones, and, therefore, much less dangerous to the inexperienced than are the untested ones that seem so promising, but lead so often to failure. As examples of Dr. Tyson's treatment, we cite the outlines for some important diseases. For typhoid fever the Brand treatment is recommended as best of all, but, as a substitute in cases where it cannot be used, the well-tried expectant symptomatic treatment is described, as carried out by the best authorities up to a few years ago. We note that Dr. Tyson no longer uses calomel in the beginning. If the patient be seen early, a proper dose of calomel can do nothing but good, and even in the later stages this, or what is usually preferable, a simple enema, deserves a stronger recommendation, we think, than Dr. Tyson gives. Since the blessed word intestinal antisepsis, however, has become a trade-mark many think it has no meaning—like the names of proprietary remedies. Of the antiseptic treatment as a routine method, Dr. Tyson justly says it "has not a truly rational basis, while the extravagant claims of its advocates discredit their results." For diphtheria a combination of local antiseptic applications, constitutional treatment, and serum is recommended. The second indication is filled by bichloride of mercury, tincture of chloride of iron, and potassium chlorate. The indications for tracheotomy and intubation might be more explicit, and, for the benefit of the young physician, it might be said that vapor of water from a tea-kettle is quite as useful as that from slaked lime. For croupous pneumonia, admitting that "no single plan of treatment dare be recommended," the author speaks highly of the ice-poultice. Opium for pain, and whiskey, strychnine, and ammonium carbonate for exhaustion, are advised. The indications for and against digitalis are well stated. It is a good thing for the profession that Dr. Tyson gives his voice for the well-tried inorganic preparations where iron is indicated. Many recent graduates have an idea that only very complicated and more or less secret preparations of iron can be of any value. The statement that one of the author's cases of hæmaturia "yielded to the electric bath" will probably be looked on by therapeutic skeptics as figurative.

The doses are given in both the old and the metric systems, and, as usual in English books, are translated from the former into the latter. The authors of these books may not expect readers to follow them blindly, but we have observed that those who learn the metric doses in this way either follow blindly or not at all, and the practice seems more

likely to retard than to advance the use of the metric system. Why should a student be asked to remember a dose carried to five decimal places, which a German or French teacher would not take beyond three? If, for example, in giving ipecac, we leave out half a grain, and instead of writing 1.332 write 1.3, will any harm follow? If we think of giving $\frac{1}{20}$ grain of strychnine, shall we write .00324, or may we leave out $\frac{1}{270}$ grain, and write .003? Let us learn and teach our metric doses as such, and not throw unnecessary difficulties in the way.

Dr. Tyson's style is already so well known in medical literature that it is only necessary to say the present work is one of the best examples. Allusions to general literature in prose and verse are encountered occasionally, and even a striking colloquialism is met with, as "the microbes of suppuration *get in their work* and produce a purulent product or an empyema." The usually direct style is occasionally varied by inversion, as "an acknowledged remedy has come to be nitrite of amyl," and "then there is Traube's double sound, in the femoral and popliteal quite often heard." We notice some verbal peculiarities; thus we have "canceroosis," formed, no doubt, after the analogy of canceroma. "Pneumonicosis" for pneumonokoniosis does not seem so justifiable. We fail to see a good reason for the spelling of "eruthrocyte."

Of the inevitable errors of a first edition, we notice the usual number, but these are rarely of a kind to give the reader any difficulty. The so-called mountain-sickness is due, not as stated, to mountain residence (p. 47), but to unwonted exertion at unusual elevations. On page 142 "belladonna" should be "atropia." "The position and size of the prostate will also be ascertained by vaginal examinations" (p. 315), explains itself. Some words have evidently been left out at the end of the second paragraph on page 615. "Gastrodiaphony" (p. 234) should be "gastrodiaphany." "Cellutrifugal" (pp. 794 and 795) should be "cellulifugal." The statement at the bottom of page 640, in regard to poultices, is somewhat mixed.

Dr. Tyson has carried out the plan he has advocated elsewhere of giving the first names of authors cited. Though no doubt an aid in bibliographic research, it hardly seems necessary to write "William" Osler, "William" Pepper, "Hermann" Eichhorst, etc., every time these authorities are named. It was not Philip, but Patrick Manson, who did the great work on filaria, and not Thomas Sutton should be named in connection with arterio-capillary fibrosis, but Henry Gawen Sutton.

There are many useful charts and figures, some of them old acquaintances. The colored plate illustrating blood-cells is well done, but should have the amplifications mentioned. The diagram of blood-corpuscles is not drawn to scale. The index, though well selected, is too short.

We welcome Dr. Tyson's *Practice* as a most valuable addition to medical literature. It finds strong and active competitors, but there is plenty of room for it, and we are quite certain that within a short time the call for a second edition will enable the indefatigable author to correct such errors as we have mentioned. G. D.

A Manual of Clinical Diagnosis by Means of Microscopic and Chemical Methods, for Students, Hospital Physicians, and Practitioners. By Charles E. Simon, M.D., late Assistant Resident Physician, John Hopkins Hospital, Baltimore. With 132 illustrations on wood and ten colored plates. Philadelphia and New York: Lea Brothers & Co., 1896.

On reading the preface of this work one is almost led to believe that the author lacks one of the requirements that Matthew Arnold says a good author should possess, viz., soberness. We quote the opening sentence: "It is curious to note that, notwithstanding the great importance of clinical chemistry and microscopy, but little attention is paid to these subjects, either by hospital physicians or by those engaged in general practice. This lack of interest is referable primarily to the fact that a systematic study of these branches has hitherto been greatly neglected, not only in American medical schools, but also in those of Europe." Again: "It is inconceivable that a physician can rationally diagnosticate and treat diseases of the stomach, intestines, kidneys, and liver, etc., without laboratory facilities." We believe these statements are unwisely put here: first, because they are not strictly true; and, secondly, because, if true, they antagonize at the outset an audience of presumably intelligent hospital physicians and private practitioners. We suggest that if the paragraphs were modified they would be closer to the truth and not so offensive to oversensitive physicians, who might dislike to be told that they showed a great lack of interest in, or paid little attention to, these matters of prime importance—"these unjustly neglected subjects;" and the sentences would possess more of Matthew Arnold's quality of soberness. Would they not better read: "It is gratifying to note that more and more attention is paid by hospital physicians and those engaged in general practice to two subjects of great importance, clinical chemistry and microscopy?" "While physicians can often successfully diagnosticate and treat some diseases of the stomach, intestines, kidneys, and liver, etc., without laboratory facilities, there are many diseases of these organs that can only be rationally diagnosticated and treated with the aid of a laboratory?"

One is gratified, however, to find in the body of the book few rash statements. Conclusions are not hastily reached. New methods whose value is not yet fully established are advocated with caution. Methods of others are fairly described, even though not sanctioned as the best by the author; yet the book is not lumbered up with a rehearsal of obsolete or impractical procedures that might be placed in a complete treatise on clinical diagnosis, but would be confusing in a work of this scope.

We can best show the ground covered by quoting the author's own words: "Chemical and microscopic methods are described in detail, so that the student and practitioner who have not had special training in such manipulations will be enabled to obtain satisfactory results. The subject-matter covers the examination of the blood, the secretions of the mouth, the gastric juice, feces, nasal secretion, sputum, urine, transudate, exudate, cystic contents, semen, vaginal discharges, and milk. In every case a description of normal material precedes the pathologic consideration, which latter in turn is followed by an account of the methods used in examination."

The book is fitted for laboratory work, being eminently practical. It contains the best of von Jaksch, Neubauer and Vogel, Ehrlich, Hayem, Ewald, Boas, and others. But one readily sees that Simon has himself gone over the ground, so that the work is more than a mere compilation; it shows judicial selection based upon personal practical experience, and in many places we find the results of original work recorded, as on page 158 (Indicanuria), page 401 (Ehrlich's reaction), page 352 (nucleo-albuminuria). The style is clear and concise.

To the Blood there are devoted nearly seventy pages. The chemical and microscopical examination of the normal blood is carefully considered, as well as that of pathological blood. Of particular value is the clear classification of leucocytes (after Ehrlich), with the various formulæ for stains. The bacteriology and parasitology of the blood are also taken up, and the importance of the examination in suspected sepsis, glanders, malaria, etc., briefly but plainly set forth. The caution of the writer is seen in his statements regarding the fate of the sporules after segmentation of the plasmodium malariæ, when he says: "The ultimate fate of these little bodies is as yet unknown, but it is likely that they in turn invade new corpuscles, etc." (page 81). The same freedom from dogmatizing concerning still unsettled questions is seen in his discussion of the nature of the malarial crescents. The differential table of the more important diseases of the blood (page 85) will be found valuable for reference. There is always a danger, however, that a student will misuse such a table, and will try to make it supply the place of text. No table can be profitably studied or rightly understood unless there has been previous study of the text.

The value of serum-diagnosis of typhoid fever has been established too late for insertion in this volume, and may justly be regarded as still, in a measure, on trial. Possibly the author regards Neusser's granules as of doubtful value in diagnosis, and has omitted reference to them on this account. A mention of them would not, however, have been out of place.

The subject of the bacteriological diagnosis of diphtheria is ably discussed and the technique fully described. Personally, we have found it easier, particularly in the case of nervous children, to use a sterilized cotton swab, that is carried in a sterile test-tube, in place of the forceps or platinum loop advised by Simon.

The subject of the Gastric Juice and Gastric Contents occupies about sixty-five pages. Discretionary judgment has been shown in excluding much material that might have been inserted here, but which would have served rather to confuse than otherwise. The few tests believed by the author to be the most reliable and the simplest are clearly described. That the chemical examination of the gastric contents is still in a somewhat chaotic state, and that one should not place too great reliance upon present methods and conclusions, is shown by the constantly changing relative value of tests. Thus Simon points out that since Schreiber's researches one can diagnosticate hypersecretion only when from 100 to 1000 c.cm. of pure gastric juice can be obtained from the non-digesting stomach (page 101). He believes that the phloroglucin-vanillin test of Günzburg is to be replaced by Töpfer's dimethyl-amido-azo-benzol test, which is as easy of application, more delicate, and can be made use of in a quantitative examination. His experience also with Uffelmann's test is that it is rather uncertain. Boas's test-meal, Boas's test

for lactic acid, and his conclusions as to its significance as indicating carcinoma are indorsed. It should not be forgotten, however, that adverse opinions as to the diagnostic value of the finding of lactic acid based upon careful tests, and later post-mortem examinations, are not lacking. As further showing the changing views regarding the stomach may be mentioned the fact that Simon, with others, regards the organ as bactericidal rather than digestive in function.

We are glad to see the composition of a normal solution of sodium hydrate plainly set forth, and not assumed as known (page 104). While physicians ought to know its composition or to be able to figure it out from a knowledge of chemistry, it is a fact that many have forgotten it, and the writer has known more than one student and practitioner who has gone through page after page of index and text in works on chemistry or diagnosis in a vain hunt after the composition of the solution in question.

What is known concerning the examination of the feces as an aid to diagnosis is given in the next chapter. In reading that a stool may occur "only every two, three, or four or more days, or even weeks or months" (page 175), and of the case "in which only four stools occurred in one year" (page 160), we are reminded of the case mentioned by Catullus, in which there occurred but "ten stools a year, and these harder than a bean." As the man was an enemy of Catullus, possibly the case ought not to be quoted as thoroughly reliable. And we are glad to see that another illustration of the laxative effect of psychic influences, of nervous worry and excitement, has been brought forward. The soldier who unconsciously has a bowel-movement during the excitement of his first battle has done duty long enough. The diarrhœa of the student before examination takes the place of the time-honored soldier (page 203).

From the chapter on the Sputum we quote the following: "When working with sputa which are known or suspected to be of tubercular origin the greatest care should be exercised to keep the expectoration from drying and becoming disseminated in the air. Negligence in this respect may result in the most serious consequences" (page 212). This we most heartily indorse. Its importance in the mind of the author is shown by the fact that the words are in italics. We might add that the same care should be exercised with pneumonic sputa, and with urine or feces suspected of being tubercular. The point is well made (page 236) that the presence in the sputum of pneumococci is not absolutely pathognomonic—*i. e.*, of croupous pneumonia. Also, that there is nothing in the appearance of the sputum in phthisis that is characteristic, the appearance varying with the stage of the disease, its extent, the existence of complications, etc. (page 236).

The subject of the Urine receives ample treatment, nearly one-half the book being devoted to this topic. We can merely refer to a few points.

As worthy special commendation is the clear exposition of the changes that take place in a normal urine when allowed to stand at an ordinary temperature (page 240). Also the very complete discussion of the specific gravity of the urine (page 247), of urea (page 287), and of Ehrlich's reaction. Jaksch is justly criticised for his description of this reaction and his imperfect conclusions based upon his imperfect method (page 401). The exposition of how much may be learned from a carefully made nitric acid test is unusually clear (page 354).

The author's views upon albumin are of interest. "The presence of albumin in every case is a pathologic phenomenon" (page 336). "A transitory, intermittent, and cyclic albuminuria is not infrequently observed in apparently healthy individuals; but the facts so far brought forward do not warrant the assumption that such forms of albuminuria are physiologic" (page 338). "Albuminuria may be regarded as a constant symptom of typhoid fever" (page 342). "A purely renal nucleo-albuminuria—*i. e.*, an elimination of nucleo-albumin from the blood through the kidneys—does not exist" (page 353). "According to Kühne's definition of peptones, a peptonuria hence does not exist" (page 350). The trichloracetic acid test is "undoubtedly the most delicate of those so far described, but not so delicate that a trace of albumin or nucleo-albumin, as has been suggested by some, can be demonstrated in every urine" (page 359). "As far as the existence of a cylindruria *sine* albuminuria is concerned, the author must confess that he is rather skeptical as to the actual occurrence of such a condition" (page 450). The reviewer believes he has seen such a case. And he further believes that in almost every urine a solitary cast or two can be found, if the urine be allowed to stand for twenty-four hours in a sediment-glass, if the sediment is centrifugalized and this second sediment examined microscopically. This, it will be observed, is the refinement of sedimentation.

We regret to see on the part of most authors a persistent refusal to include in the tests for sugar that of Haines, of Chicago. His modification of Fehling's test is the best routine test, because easiest of application and because the solution is stable.

The book is neatly gotten up, and the illustrations and plates, many of them original, are in general excellent. A few proof-reading errors will be corrected in a later edition. We hesitate to criticise the taste of the medical publishers, who stand at the head of their profession in this country, and in so doing we may show a lamentable ignorance of things typographical and an uncultured taste; but we cannot refrain from saying that the style of letter "f" employed is not to our liking. It seems to stand out on the printed page like a wry-neck or hump-back in a crowd. And if they will use a crooked "f", why not be consistent and crook it also when they use "fi" and "fl"?

After carefully looking over this work we believe it is destined to become a standard class-room work. As it goes through subsequent editions it will be shaped more and more to practical laboratory work, and will be found upon the desk of the worker in clinical medicine as is Gray's *Anatomy* or Heath's *Dissector* upon the dissecting-table of the student of that subject. J. B. H.

OPHTHALMIC OPERATIONS AS PRACTISED ON ANIMALS' EYES. By CLARENCE A. VEASEY, A.M., M.D., Adjunct Professor of Diseases of the Eye in the Philadelphia Polyclinic, etc. Philadelphia: The Edwards & Docker Co., 1896.

THIS little book, of about 100 pages, 12mo., well printed in large type, and fully illustrated with cuts of the instruments required and the manner of using them, covers ground not before occupied. Even

one by no means devoid of the power to adapt an operation to the conditions of the particular case will find the practising of operations on the eyes of lower animals made easier by following descriptions especially adapted to such practice, instead of having only the descriptions of these operations as they are to be practised on the patient, which are found in works on ophthalmology.

The descriptions here given are clear, brief, and to the point; and numerous hints are included which a good teacher would be likely to give to his student, but for lack of which he who studies alone may be at a serious disadvantage.

Operations on the lids have been omitted as being best practised upon the cadaver rather than on the eyes of the lower animals. These, with operations upon the lachrymal passages, and some of the more common modifications of the operations that have been here described, might, we think, have been included with advantage. Perhaps, too, some addition to the matter would have lessened the need of spreading it so much by the use of very large type, although large type is quite desirable in a book which may be used for reference while the operations are being practised. E. J.

DIE INFECTIONS-KRANKHEITEN. IHRE ABWEHR UND UNTEDRÜCKUNG. Von DR. HEINRICH BERGER, Kgl. Kreisphysicus in Neustadt a. Rhbe. (Hannover). Brauschweig: Friedrich Vieweg & Sohn, 1896.

INFECTIOUS DISEASES; THEIR PREVENTION AND SUPPRESSION. By DR. HEINRICH BERGER.

THIS little book "is intended to serve as a guide to all who labor for the welfare of mankind, so far as the infectious diseases are concerned." So we are told in a brief announcement by the publisher, who also states that before laws regarding these diseases can be made effective instruction is necessary concerning the infectious diseases. Suitable laws and adequate instruction are therefore the subjects of the work. Considering the difficulties inherent in these subjects, the work must be said to be well done. It is intended more for intelligent laymen, such as teachers in schools, superintendents of asylums, and practical hygienists, but from the convenience of its arrangement may be found useful by physicians, health-officers, and others to whom the details are already familiar.

The matter is divided into a general and a special part. In the former are discussed such topics as the conception of infectious diseases, the possibility of their successful control, classification, international and national, local and individual preventive measures, public and private hygiene, the recognition of infectious diseases, notification, diagnosis, protective measures, indemnification, punishment. As an appendix to this part the author submits the scheme of a law for the control of infectious diseases.

In the special part there are descriptions of all the infectious diseases, including those acquired from animals and the parasitic skin diseases, showing the symptoms, cause, mode of entrance, and methods of prophylaxis. These features are also arranged in tabular form at the end of the work.

The author's method is a good one, and his knowledge on the whole accurate. The plans proposed for lessening the spread of infectious diseases are usually admirable, though often of a kind not readily carried out in countries where the liberty of the subject is cherished more than the preservation of health, and, as the author admits, require a more rigorous control of "healers" than is now possible in any country. The instruction of teachers in the elements of hygiene and the teaching of the elementary facts regarding infectious diseases to the masses are urged. The author doubts the wisdom of trying to instruct children, as is now done, by teachers without proper understanding of the subject, but would prefer to have the teachers prepared to instruct, rather than allow physicians to do that, as some have proposed.

Altogether, the book is a readable and suggestive one and may do much good if it reaches those for whom it is intended. G. D.

THE JOHNS HOPKINS HOSPITAL REPORTS. Volume V. Baltimore: The Johns Hopkins Press, 1895.

FOR importance of the subjects treated, and for mode of presenting the matter, this volume is difficult to equal. More than 200 of its 500 pages are taken up by the article of W. S. Thayer and John Hewetson, on The Malarial Fevers of Baltimore. This modest title does not indicate the real scope of the article. Much of it is devoted to the analysis of 616 cases of malarial disease studied from the modern point of view in the Johns Hopkins Hospital from June, 1889, to August, 1894. But besides this, the whole subject of malaria is treated in a manner deserving the highest praise. Based on a larger experience than that of Mannaberg, the author of a valuable monograph published three years ago, the American authors have approached the various problems in a more objective manner than did the previous writer. The development of our knowledge of the malarial parasites, the methods of examination, the clinical features of the disease, and the various theoretical problems involved are all discussed, briefly but with admirable clearness. The list of references contains 359 numbers. The illustrations, "made in Germany," are more accurate and more artistic than any hitherto published of the malarial parasites.

This paper is followed and supplemented by a Study of Some [four] Fatal Cases of Malaria, by Lewellys F. Barker, illustrated by four excellent plates. Together these form a treatise on malaria that should be widely studied. The business-like description and careful observations might serve as a lesson to those who, without either experience or observation to speak of, still oppose or ignore such facts as are here accumulated. The way in which light may be shed on puzzling cases in practice should be taken to heart by all who are struggling with obscure ailments in which malaria is thought to be a factor and which can surely be elucidated by such methods as are here detailed.

The rest of the volume is devoted to Studies in Typhoid Fever. This contains a General Analysis and Summary of the Cases, Special Features, Symptoms, and Complications, Five Years' Experience with

the Cold-bath Treatment, Neuritis during and after Typhoid Fever, Chills in Typhoid Fever, and A Study of the Fatal Cases (continued), all by Dr. Osler; Pyuria in Typhoid Fever, by George Blumer; Certain Forms of Infection, by Dr. Flexner; An Investigation into the so-called Lymphoid Nodules of the Liver, by Dr. Walter Reed; Post-typhoid Bone-lesions, by Harold C. Parsons.

This notable group of articles should be widely read as a commentary on some of the most important features of a most important disease, and as a record of some rare conditions in it, abstracts of which would do justice neither to authors nor to readers.

The volume is well printed on thick paper, and contains, besides the plates mentioned, a large number of charts. G. D.

Ætiologischen Studien über Lepra. By Dr. Edward Ehlers, Instructor in the University of Copenhagen. Pp. 64, with 22 illustrations. Berlin, 1896.

Etiological Studies on Lepra.

The investigations of Dr. Ehlers were conducted mainly in Iceland, but in the brochure before us the disease in its etiological bearing is discussed from a general point of view, including all the more important theories that are held in various countries where leprosy is endemic. The author does not believe in the theory advanced by Zambaco Pascha, that lepra mutilans and Morvan's disease are identical. He concludes from his studies that autochthonous lepra does not exist, there being no proof in substantiation of this view. Zambaco Pascha has proved what Neisser before him showed to be the case, namely, that leprosy still exists in France; but the proof of its autochthonous existence is wanting. It is impossible to state positively that a person has never been in contact with a leper. To-day the dangers of contagion are as great as in the middle ages, and many Europeans contract leprosy by travelling in countries where hygiene and sanitary measures are not practised as they are in Europe and in the United States. As concerns the inhabitants of Bretagne, France, it must be remembered that they are in close relations with the people of Iceland, for every year, the author states, not less than 4000 fishermen from Bretagne frequent the west coast of Iceland. He contends that the disease is contagious; that heredity plays no part in its production; and that Armauer Hansen (the discoverer of the bacillus lepræ) was right in unhesitatingly putting forth these views.

The brochure, which can be highly recommended, is illustrated with a number of photographs showing the several varieties of the disease in different stages, and there is much clinical material in the shape of notes of cases, all in a condensed form, with special reference to etiological questions. It should be in the hands of all who are interested in matters pertaining to sanitary legislation and hygiene. L. A. D.

PROGRESS

OF

MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD W. WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

Antistreptococcal Injections in Scarlet Fever.—Dr. Yot reports their successful use in a single instance. While it cannot be affirmed that recovery would not have taken place without these injections, yet it is no less true that after each injection there was an amelioration of the symptoms, which could not have been a simple coincidence. Under similar circumstances the author would not hesitate to employ them, nor would he wait until the patient was profoundly infected. Although a trifling abscess appeared in spite of all antiseptic precautions, this fact should not lessen our opinion of the advantages of the treatment.—*Journal des Praticiens*, 1896, No. 52, p. 823.

The Anticoccal Therapeutic Serum.—Mme. N. O. Sieber-Choumowa states that since the immunization against staphylococci and streptococci is obtained only through living cultures, and not by filtered and sterilized toxins, it is necessary to observe caution in drawing the blood, in order to obtain a serum which shall be both curative and harmless. A preliminary bleeding must be made and the results thoroughly tested. After pointing out the danger of increasing *ad libitum* the quantity of cultures injected into the horse, so that the serum shall be of the greatest possible strength, the author proceeds to say that the serum obtained from the goat has never given rise to disagreeable consequences, as eruptions or painful sites after injection, although used in considerable quantity. Goats can be advantageously used for the manufacture of these serums, because they bear well the injections of living cultures and micrococci, and are also resistant to infection. Besides, it is less expensive to sacrifice a goat, than a horse, by a too rapid process of immunization. As to what extent we may hope to obtain a curative action from these serums many interesting observations are cited. We know that the serum of animals immunized against certain microbes is preventive against other microbes, so that the action of a serum is not always specific. For instance, the antitetanic serum is active against the poison of serpents.

The serum of animals immunized against symptomatic malignant pustule acts upon the bacillus of acute septicæmia. In certain cases human as well as equine serum possesses a preventive action against cholera. Notwithstanding these observations we have a right to demand that these serums shall have a specific action against pure infections, and as well against mixed infections marked by the presence of some one or other of these cocci as complications. Under the latter division come pyæmia, septicæmia, septic forms of diphtheria, erysipelas, phlegmons, osteomyelitis, and analogous infections. It is likely that the still-debated question concerning the identity of various species of streptococci will soon be solved from the standpoint of immunization. It is also of interest whether the serum of animals immunized by erysipelatous streptococci acts with the same power against the processes set up by other species of streptococci. Of the special work detailed may be mentioned the immunization of a rabbit to streptococci from angina; two goats to streptococci; a goat to staphylococcus aureus; two horses to streptococci—one, however, succumbed before complete immunization was obtained.—*Archives des Sciences Biologiques*, 1896, No. 5, p. 415.

Antirabic Vaccinations at St. Petersburg.—Dr. V. Kraiouchkïne reports that of the patients treated 13 abandoned it of their own accord; 11 were not bitten, but fresh wounds had been exposed to the saliva of rabid animals; 7 had been bitten by animals which were not suffering from hydrophobia, and 2 were treated because they feared the results of drinking milk from a rabid cow. Of the 269 persons treated, all were bitten by dogs (205 upon uncovered portions of the body) excepting 21. Of these, 12 were bitten by wolves and 9 by cats. Of the whole number, 2 died. The first, a man thirty-five years old, was severely bitten by a wolf, terribly lacerating the face, and inflicting three tears upon the left hand. The wolf was proved to have suffered from hydrophobia by a post-mortem examination made by a veterinary surgeon. Treatment was commenced two days after the injury and continued for twenty-four days. Two days after his discharge he was attacked with hydrophobia and died two days later. The second, a boy, aged eighteen years, received seven penetrating wounds upon the right hand from the bite of a dog. There was suspicion, but not proof, that the dog was mad. Seventeen days later treatment was begun. On the eleventh day of treatment the patient complained of a pain in right shoulder, hand, and fingers. The next day there were difficulty in swallowing and general nervous irritation. The treatment was now suspended and two drachms of serum from an immunized rabbit were injected, and on the following day the patient died.—*Ibidem*, p. 476.

The Action of Tuberculin.—M. A. Loesch, from extended experimentation, reaches the following conclusions: (1) The blood-reaction with tuberculous animals is more apparent than the temperature-reaction. (2) After an injection in tuberculous animals, at the end of from two to four hours there is diminution of the number of white corpuscles; in healthy animals there is no diminution. (3) In tuberculous animals the leucocytosis is at a maximum, not upon the next day, as with healthy animals, but at the end of two days after injection. (4) With healthy animals the temperature is elevated

after injection a degree or more; but a single elevation of temperature does not determine the existence of tuberculosis. (5) With normal guinea-pigs, after injection, at the end of one or two hours the temperature sensibly rises; but it rapidly falls, so that in five or six hours it becomes normal. With tuberculous individuals the diminution of the number of leucocytes after an injection of tuberculin is a general phenomenon.—*Ibidem*, p. 483.

The Artificial Antitoxin of Diphtheria.—M. G. A. SMIRNOW describes the process as follows: the toxin (serum or bouillon) is placed in a U-tube at the base of which is a cock, so that the products formed at the positive and negative poles may be separated. In each opening is placed a platinum electrode, through which is passed for a certain time the constant current. At the positive pole the reaction is acid, and we find the acid radicals of the salts, principally the phosphates; at the negative the reaction is alkaline, and we find the metals and bases. The cock is now closed and the excess of acid and alkali neutralized, when it will be found that the solutions have not only lost their toxic, but have acquired curative properties. The great advantage of this antitoxin is its cheapness and its easy and simple preparation. It seems, then, that the preparation of an active, specific remedy for diphtheria is not the exclusive monopoly of the animal organism. The conclusions are: (1) That antitoxin is only a poison which is oxidated or hydroxidated. (2) That the electric current is not a specific force, producing under these conditions an antitoxin, but this is the result of the reciprocal action of the organic substances of the diphtheritic bouillon and the products of the electrolysis of the added salts—*Ibidem*, p. 502.

Syphilis and Antitoxin.—MR. A. W. FINCH NOYES, JR., cites as reasons for the belief that acquired syphilis is produced by a particulate virus, probably a microphyte: (1) The inoculability of the disease, transmission always taking place either by direct contact or by mediate communication. (2) The presence of an initial lesion at the point of contact, in this resembling other inoculable diseases of microbic origin. (3) The diffusion of the disease from the originally infected focus through the system as a disease due to a particulate virus would be distributed—*i. e.*, through the lymphatic vessels—both of which retain some of the infecting element, and finally into the blood-stream. (4) The protection produced by a single attack. (5) The immunity without the previous occurrence of the recognized symptoms of syphilis, observed in mothers who have borne syphilitic children. The filtration of small doses of toxin through the placenta from the syphilitic fœtus sufficient to produce partial or complete subsequent immunity, but not sufficient to produce symptoms of syphilis at the time, may explain this clinical observation. It is an interesting scientific fact that the serum of the fowl, which is naturally immune to tetanus, cannot produce immunity in susceptible animals; but if a dose of tetanic toxin be given, the serum immediately assumes antitoxic properties. Acting on this analogy, antisyphilitic serum has been prepared by previously injecting immune animals with syphilitic serum. Six patients have been treated with the serum thus prepared—one in the earliest stage, as soon as the primary sore was recognized; two during the secondary stage; and three in the tertiary period. The results were vari-

able; the influence was more marked in the tertiary lesions, less marked in the late secondary manifestations, and practically *nil* in the early secondary and primary cases; in fact, it was in inverse ratio to the activity of the disease, or, in other words, to the activity of the toxin which it was sought to neutralize. The serum does not seem to produce anything more than a local immunizing effect; it produces no constitutional immunity, as evidenced by the recurrence of lesions after the discontinuance of the injections. Whether antisyphilitic serum, as now prepared, will find any place among reliable therapeutic agents is still *sub judice*. That it may do good is possible, especially in those cases which are intolerant to mercury and iodides. Apart, however, from the utilitarian aspect, it is of some scientific interest that a serum should be obtainable which exerts the influence shown in some of the cases reported in this paper.—*Intercolonial Medical Journal of Australia*, 1896, No. 11, p. 635.

The Treatment of Tic Douloureux.—Dr. William Ewart cites the following indications: (1) The sedative; sleep being the first essential and the basis of the entire treatment. It is necessary that the narcotic prescribed shall be sufficiently strong to procure prolonged slumber. Chloral and morphine combined will usually prove effectual. (2) The restorative; this includes mental and bodily rest and suitable alimentation. Rest in bed is indicated in all severe cases until remedies have taken effect, and the success of treatment may largely depend upon this means of economizing nerve-energy. Alimentation needs to be adapted to the irritable state. The tenderness of the mouth and its unhealthy state, the feeble and faulty digestion, call for a careful selection and for a progression in diet. The object is to raise the nutrition without overloading the blood with nitrogenous waste. A liberal supply of vegetable foods and a moderation of the nitrogenous are generally indicated. Alcohol is to be avoided, but in enfeebled and underfed subjects stout or even port wine may be allowed as a temporary help to nutrition. (3) The alterative; in genuinely gouty cases this may be directed toward the gout, but with careful avoidance of any depressing agents. Generally, methods which favor absorption as well as glandular activity (particularly that of the liver) will meet the gouty as well as the general indication. The salicylates, benzoates, sulphur, ammonium chloride, and taraxacum are available, but probably do not equal in efficacy the salts of iodine and of mercury, and particularly their combination in the proportion of twenty to thirty minims of the solution of corrosive mercuric chloride (1 to 960) and of six to ten grains of potassium iodide. The latter may be used alone, but in sufficient doses, and its action seems to be promoted by the addition of tincture of iodine in fifteen to thirty minim doses. As a useful adjunct guaiacum has been prescribed, but, if used, should be administered separately. These drugs act both by relieving vascular tension and also favorably upon glandular and general metabolism and upon absorption. (4) The tonic; these measures are less dependent upon drugs—although the vegetable tonics may be used with advantage—than upon hygiene, and, above all, upon muscular exercise, which has the advantage of diverting energy from the oversensitive nervous mechanism while raising the general nutrition. Muscular work should be at first passive and only gradually increased. Ordinary massage may be applied

at an early date after the needful long sleep has been obtained, and should be gradually replaced by the "resistance-movements" and in suitable cases by Swedish gymnastics. Salt baths may be combined with this treatment, which by diverting the circulation to the skin and muscles would tend to relieve the nervous system.—*British Medical Journal*, 1896, No. 1873, p. 1496.

The Treatment of Cerebro-spinal Meningitis by Hot Baths.—Dr. M. Jewnin reports five successful cases. Noting the reports of Aufrecht (one case) and of Woroschilsky (two cases), he details his own. The temperature of the daily bath varied from 99.5° to 104° F., but the duration was not stated. So far as this report shows anything, it may be said that these baths are harmless, and, further, that they quiet the patient. It is also to be noted that whereas most authors call attention to the great emaciation which results from the disease, so that in this respect it recalls tuberculosis or carcinoma, under this method there was no marked loss of weight, but, on the contrary, three of the five made a distinct gain.—*Therapeutische Monatshefte*, 1896, Heft 11, S. 581.

The Effect of Tuberculin in a Case of Tuberculous Meningitis.—M. E. Mourange reports an instance of the use of this remedy. From this it is difficult to arrive at any conclusion. The injection of a very minute dose after complete coma had persisted for twenty hours was followed by spontaneous movements, ability to speak, and recovery of consciousness. On the next day the paralytic phenomena, the deviation of tongue and face, the pupillary inequality, and ptosis disappeared. The continence of the sphincters was regained to the extent that an enema was retained for an hour and then expelled with feces, and that there were three voluntary urinations. On the following day the patient seemed to be cured; but later in the same day fever reappeared, with pain and swelling in the left buttock, and the patient died upon the following morning. It is doubtful if this primary improvement could have been a coincidence, for the injection was followed by prompt febrile reaction, and the swelling was doubtless due to the awakening of an old tuberculous focus It seems fair to believe that had the patient not been enfeebled by fifteen days of illness prior to the injection the result might have been different. The intensity of the resulting febrile reaction from the peri-anal phlegmon contributed to this result rather than did the cerebral lesion.—*Gazette hebdomadaire de Médecine et de Chirurgie*, 1896, No. 89, p. 1057.

Pellotin.—Dr. Alexander Pilcz has noted the necessity for a hypnotic which can be administered by hypodermatic injection. This is an alkaloid obtained from the Anhelonium Williamsii, which occurs as a white, amorphous, intensely bitter powder of slight solubility. Of this the chloride ($C_{13}H_{19}NO_3HCl$) is readily soluble and does not give rise to local irritation. The author has employed the drug in fifty-eight cases, generally in the dose of one-third of a grain, although it is best, on first trial, to use one-half of this quantity. Of these cases 50 per cent. showed satisfactory results; in over 29 per cent. the result was moderate, and in nearly 21 per cent. failure ensued. If the patient fell asleep in from one-half to one and one-half

hours after injection (nine o'clock in the evening), and remained asleep the entire night, the result was deemed to be satisfactory. Only two patients complained of nausea and heaviness of the head, and one of these was a paranoiac who had shown various hallucinations. Collapse was not observed.— *Wiener klinische Wochenschrift*, 1896, No. 48, S. 1121.

The Action of Apolysin.—Dr. V. Gez has made use of this remedy in the treatment of 50 patients: croupous pneumonia, 2; syphilis, 1; scarlatina, 1; pleuritis, 5; muscular rheumatism, 11; hemicrania, 5; angina follicularis, 1; caries vertebræ, 1; articular rheumatism, 5; neuralgic pains, 10; lumbago, 3; septicæmia, 1; tabes dorsalis, 3; typhoid fever, 1 case. Of these, 9 are reported in detail. The daily dose was from forty-five to one hundred and five grains. He concludes that this is an indifferent pharmaceutical product which possesses no analgesic and but very slight antipyretic and diuretic properties.— *Wiener klinische Wochenschrift*, 1896, No. 22, S. 466.

The Physiological Action of Solanum Carthineuse.—Dr. E. Q. Thornton has experimented with soft extract administered by the mouth and hypodermatically to frogs. In thirteen experiments he found that the drug depresses respiration, has little or no effect upon circulation, depresses the cerebrum, and stimulates the cord. It can be administered to a healthy man in single doses of thirty grains or daily doses of sixty grains, without the production of apparent effects.—*Therapeutic Gazette*, 1896 No. 11, p. 722.

The Treatment of Cardiac Diseases by Mechanical and Hydro-mineral Methods.—M. Ernest Barié states that the general results of Oertel's method are: (1) Increase in the activity of combustion with diminution of the fat-excess in the entire economy, and in particular in the heart. (2) Increase of cutaneous excretion and aqueous exhalation from the lungs, with disappearance and elimination of œdema and local dropsy. (3) Increase of the contractile energy of the myocardium, re-establishment of equilibrium of tension between the arterial and nervous systems, and, consequently, regulation of the course of the blood. This method is of absolute utility in certain well-compensated cardiac lesions, in cardiac neuroses, and especially in obese patients who are hearty eaters. It should be forbidden in recent endocarditis, true angina pectoris, advanced arteriosclerosis, in lesions of the valves and orifices, in hyposystole, with much stronger reason in the asystolic period, in degenerations of the myocardium, and in aortic aneurism. The altitude-method, provided that it is rigorously watched, may perhaps give as good results as the preceding. The limit of about three thousand feet must not be exceeded, and with the appearance of the slightest contra-indications absolute rest;—dorsal decubitus must be insisted upon until the patient is able to descend to a lower level. Gymnastics and certain bodily exercises may be very properly recommended. These may diminish the blood-stasis in the venous system and pulmonary vessels, diminish the obstacle to the flow of blood in the systemic circulation, and facilitate the work of the left ventricle and strengthen the heart-muscle. They are contraindicated in asystole, aortic aneurisms, fatty degeneration of the heart, and advanced arteriosclerosis. Among the physical exercises the use of the bicycle at

the present time occupies the first place. The conclusion is reached that this may be permitted to some, but absolutely forbidden to others. The condition of the arteries must be examined, and it goes without saying that advanced arteriosclerosis, atheromatous arteries, and aneurismal dilatations are absolute contraindications. Massage applied with gentleness may be of real service if rough friction upon the œdematous limbs be avoided, which may cause erythema or excoriations which are likely to slough. As for baths, we must not forget that the entrance into even a tepid bath with these patients often occasions a marked sensation of oppression. The bathing must be watched, and at the outset only baths of short duration and of temperature near the body-norm employed. For all that, with few exceptions, a cure of rheumatic endocarditis is not known; yet it is beyond question that certain waters, as those of Nèris, of Plombières, and perhaps more especially those of Bagnols (Lozère), render real service to rheumatic patients who suffer from cardiac affections, particularly if they are young subjects or those whose lesions are recent. It is likely that these thermo-mineral waters place the patient beyond the influence of new rheumatic attacks and oppose, up to a certain point, the pre-established cardiac lesions.—*La Médecine Moderne*, 1896, No. 93, p. 705.

MEDICINE.

UNDER THE CHARGE OF

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The Dorsal Test for Pericardial Effusion.—EWART (*British Medical Journal*, January 23, 1897) describes a quadrilateral-shaped, dull area at the posterior thoracic base in cases of pericardial effusion, which he thinks is of material aid in diagnosis. It was referred to by him in an article in the same journal on March 21st of last year. He terms this area the "pericardial dull patch." Vertically, it extends from either the ninth or tenth rib, according to the amount of the effusion, to the twelfth rib, and horizontally from the spine to a point just within the angle of the scapula on the left side, while on the right side it does not reach more than half this distance. The outline of the dulness is well defined, giving the mapped-out area a definite quadrilateral shape. Under normal conditions this area is resonant on percussion, but the occurrence of a pericardial effusion tends to diminish the factors which normally give a resonant note over this area and to increase the factors producing dulness. Ewart mentions the following as the most likely influences: 1. A slight upward displacement of the com-

pressed base of the lung. 2. A slight downward displacement of the anterior portion of the left hepatic lobe under the weight of the pericardial effusion without any marked depression of its posterior portion. 3. A corresponding depression of the stomach, with or without slight depression to the left. This "pericardial dull patch" is essentially of hepatic origin, owing to the change produced in the position of the liver, and is not the dulness produced by the effusion itself. This dull area occurs normally in children under four years of age, and Ewart explains its occurrence to the greater size of the liver and to the shortness of the lung, allowing the former to come more directly into contact with the post-thoracic wall. He has also found it in phthisical patients where the left lung is contracted. Notwithstanding these exceptions, he finds the sign a very valuable one in the diagnosis of pericardial effusions. Although Ewart admits that cardiac hypertrophy might be expected to give the same sign, he has never succeeded in obtaining it in simple enlargement alone.

The Active Constituent of the Thyroid Gland.—HUTCHISON (*British Medical Journal*, March 23, 1897) gives clinical evidence favoring the view already published by him that the active constituent of the thyroid gland is contained in the colloid material. He showed in a previous communication that the proteids of the gland were two in number: 1. A nucleo-albumin present in small amount and probably derived from the cells lining the acini. 2. The colloid matter, made up of a proteid and a non-proteid part, the latter containing in all probability Baumann's thyroidin. Further, certain extractives are also obtained from the gland, as creatin, xanthin, etc. Hutchison found the extractives absolutely inert when administered either to healthy persons or to cases of myxœdema. The same result was obtained on giving the nucleo-albumin. The pure colloid matter gave the ordinary signs of thyroid activity in healthy individuals, and in large doses distinct thyroidism resulted. Marked beneficial results were obtained on administering it to a patient with myxœdema. The proteid and the non-proteid constituents of the colloid were then given separately, and although benefit resulted from the former, yet the most favorable results were obtained from the adminstration of the latter.

Ascertaining in this way that the activity of the thyroid was contained in the colloid material, Hutchison advocates strongly the administration of the pure colloid matter separated from the inert parts of the organ. The advantages of this method are obvious: 1. A constancy of dose is insured. The quantity of colloid in different glands varies considerably; hence the amount of active substance in dried preparations of the whole gland is really not constant. 2. The drug is quite pure. 3. The pure colloid is free from taste and odor, and keeps indefinitely. 4. A very small dose is required. 5. The colloid is absorbed with great ease and rapidity. 6. The administration of the colloid matter is really the most economical way of giving the thyroid. There is no waste of active material, as occurs in the preparations of thyroidin.

A Review of 209 Gallstone-operations, including 30 Choledochotomies.—KEHR (*Archiv für klinische Chirurgie*, Band liii. Heft 2), of Halberstadt,

has obtained remarkable results in his operations for gallstones. The results attained should interest physicians, because, as Kehr remarks, the physician has not advanced the treatment of gallstones a step in five years, while during the same period operative treatment has made great strides in the hands of the surgeon. From 1890 to 1896 Kehr performed 209 laparotomies for gallstones. These were performed on 174 patients, some having been operated on more than once. Of these, 23 were males and 151 females. Of the latter, 133 were married, 117 of whom had borne children, and 18 were single. The operations are divided into five groups: 1. Those in which the gallstone was situated either in the gall-bladder or cystic duct. Under this group there were 127 operations, with only 1 death. The fatal case occurred in a man, sixty-four years of age, who had emphysema and arteriosclerosis. 2. In 21 cases a cystectomy was performed, owing to obliteration of the cystic duct or to fibrous contraction of the gall-bladder, rendering the latter functionless. The gall-bladder was accordingly excised. Only 1 case died. 3. In 30 cases the stone was situated in the common duct, and was so large that it could not be forced either into the duodenum through the papilla or through the cystic duct back into the gall-bladder. In these cases a choledochotomy was performed, the stone being removed through an incision into the common duct. Of this group only 2 cases terminated fatally. 4. Under this group were included 17 cases, in which, instead of the suspected gallstone, either some other disease-process (as ulcer of the stomach, echinococcus of the liver, or wandering kidney) was found, or the gall-bladder, being free from stones, was, however, adherent to the omentum, stomach, intestine, or abdominal wall. Two of these cases died. These cases demonstrated to Kehr, first, that in some instances an exploratory incision is necessary to make a diagnosis; and, secondly, that adhesions between the gall-bladder and adjacent structures may produce colicky pain indistinguishable from that produced by a gallstone. 5. The last group included cases in which, in association with gallstones, there existed various complications, as carcinoma of the liver, stomach, common duct, or head of the pancreas, suppurative cholangitis, syphilis of the liver, or liver-cirrhosis. This group comprised 19 cases, 10 of which terminated fatally, while 9 obtained relief from their symptoms for periods of from one and one-half to ten months.

The mortality in the 209 laparotomies was 17 cases, or 8 per cent. Where the stone was in the gall-bladder, and was removed either by cystotomy or cystectomy, the mortality was practically 0 per cent. The highest fatality occurred in those cases associated with some grave complication, as carcinoma of the liver or pancreas, etc. The most remarkable results were obtained in the operations on the common duct, where there were only 2 fatal cases in 30 operations, or 6.6 per cent. This is in marked contrast to the results heretofore obtained. Kehr collected 82 cases from the literature, in which 26 died, giving a mortality of 31 per cent.

Experiments on the Production of Pleural Effusion.—LEATHES (*Journal of Pathology and Bacteriology*, December, 1896), in an experimental work on the production of pleural effusion, studied: 1. The effect of raised capillary pressure. 2. The effect of injury to the vessel-walls. 3. The place of origin of the effused fluid. As a result of his study he formulated the following

conclusions: 1. So long as the vessels are healthy no change in the pressure of the blood in the capillaries supplying the pleura is able to bring about pleural effusion. 2. In the hydrothorax of heart-disease we have probably the concomitant working of several factors—*i. e.*, the raised capillary pressure, and in many cases a certain amount of hydræmic plethora. These, however, are acting on the capillaries which are suffering from malnutrition, and are therefore in a subinflammatory condition. There is at the same time an impediment to absorption in the obstruction to the flow through the thoracic ducts caused by the venous engorgement. 3. In the exudation of pleurisy the chief factor is an increased permeability of the walls of the vessel in the subpleural and mediastinal tissues. The increased exudation thereby produced makes its way in the direction of least resistance, viz., the pleura. The clots found in the inflammatory exudation adhere to the pleural wall and tend to check absorption, which is also probably hindered by the pressure of the peripleural exudation on the subpleural lymphatics. In every case, therefore, in which effusion into the pleura is produced, diminished absorption is associated with the increased exudation of fluid from the vessels.

The Glandular Fever of Childhood.—Dawson Williams (*Lancet*, January 16, 1897) reports two cases of the above-named affection. E. Pfeiffer, in 1889, described a condition observed in childhood characterized by acute enlargement of the glands, which, he contended, was an acute specific fever hitherto unrecognized, and to which he gave the name "glandular fever" (Drüsenfieber). The general symptoms described by Pfeiffer and confirmed by later observers are as follows: the patient, a child under fourteen years, becomes suddenly ill; the temperature suddenly rises to 101° to 103° F.; there are anorexia, nausea, sometimes vomiting, coated tongue, constipation, and occasionally ill-defined abdominal pain. The most prominent and characteristic symptoms, however, are stiffness of the neck, tenderness in the anterior triangle, and pain on movement of the head and on deglutition. The pharyngeal mucous membrane may be slightly reddened, but at no time during the course of the illness is there a definite tonsillitis or pharyngitis. On the second or third day a swelling is noticed in the neck, due to three or four enlarged lymphatic glands, which can be felt beneath the sterno-cleido-mastoid muscle and at the anterior border. The temperature usually becomes higher at this time, and generally reaches 104° F. The tender glands remain swollen for from two to five days, and then begin to diminish. The glands on the left side are nearly always first involved, and before they begin to subside those on the right side commence to enlarge and later reach a size equal to those first involved. Abdominal tenderness may be marked, and in the majority of the cases the mesenteric glands may be felt to be enlarged. Liver and spleen are enlarged in more than one-half the cases. The axillary and inguinal glands are swollen in some instances. The disease is usually mild, and seldom, if ever, is the direct cause of death. The glandular enlargement usually disappears within ten to fourteen days. Quite marked anæmia and weakness may persist for some time after the acute symptoms have disappeared.

The two cases reported by Williams were children in the same family and presented the characteristics above described, the glandular enlargement

commencing on the left side and later appearing on the right without any associated throat-symptoms. A third child in this family had just previously suffered a similar attack, suggesting an infectious character. Pfeiffer observed that the disease occurred in very limited epidemics, generally affecting a single family, but attacking most of the members who had not passed childhood. Those who have described the disease since Pfeiffer have laid great stress on the absence of local throat-symptoms to account for the glandular enlargement. Dr. Park West reported ninety-six cases that occurred in Eastern Ohio from 1893 to 1896. They presented the general features already related. Only one case was fatal, a delicate child convalescing from scarlet fever. Hoerschelmann thinks the incubation-period is usually from eight to ten days. West observed that most of his cases showed signs seven days after exposure. Suppuration is extremely rare, although Neumann and Comby have reported cases in which it occurred. Hesse and Starck observed severe nephritis as a complication in several members of the same family.

As to the pathology of the disease little is known, and opinions vary considerably. Comby is of the opinion that it is due to an attenuated streptococcus-infection, the surface of the tonsils constituting the point of entry. He thus favors the view that the disease is an acute specific infection, with which Ashby and Wright agree. The constant association of constipation led Starck to advance the theory that the infection might be of intestinal origin due to absorption of toxins from the retained feces. Koplik suggests that the earlier involvement of the glands on the left side might be due to the passage of the infective agent from the thoracic duct to the glands on the same side. Williams thinks that the infective agent, whatever it may be, most probably enters by the pharynx or tonsils without producing a local lesion at the point of entrance.

Protective Inoculation of Man against Typhoid Fever.—PFEIFFER and KOLLE (*Deutsche med. Wochenschrift*, No. 46, 1896), from the results of experimental work on human individuals and guinea-pigs, claim that they obtained sufficient evidence to convince them that the former can be rendered immune against typhoid fever by inoculation of minute doses of dead typhoid bacilli. It has been found that persons inoculated with increasing doses of living or dead cholera-bacilli were rendered immune against cholera, and Pfeiffer and Kolle thought that immunity against typhoid could be secured by a similar procedure. Only two persons were experimented upon, and their conclusions are drawn from the results obtained in these two cases. Neither patient had ever had typhoid fever. A suspension of a typhoid agar-culture was made in bouillon. After the typhoid bacilli had been killed by keeping the suspension in an incubator for several hours at a temperature of 56° C., 1 c.cm., or what corresponded to 2 mg. of the fresh culture-mass, was injected subcutaneously into the back of each individual. Two to three hours after inoculation signs of reaction set in, such as chilliness, dizziness, sensation of discomfort, and localized pain at the seat of inoculation. The patients were cupped before and at varying intervals after inoculation in order to obtain serum. Inoculations of typhoid bacilli and human serum obtained before inoculation were made into the peritoneal cavity of guinea-

pigs. Examinations at various intervals afterward showed that the peritoneal exudate contained numerous actively motile typhoid bacilli. On the other hand, intraperitoneal inoculations of typhoid bacilli and much smaller doses of human serum obtained after inoculation gave an exudate in which the bacilli were very few and often motionless or nearly so. Further, typhoid bacilli failed to clump or agglutinate with the serum secured before inoculation, whilst marked clumping was produced by the serum obtained after inoculation. Pfeiffer and Kolle thus found that after a single inoculation with dead typhoid bacilli an antitoxic substance is produced which has the same property of causing clumping of typhoid bacilli and rendering them immotile that the antitoxic substance in the serum of a patient with or convalescent from typhoid fever has. They hope that their discovery will be of practical importance as a prophylactic measure in severe epidemics of typhoid fever, such as, for instance, sometimes break out amongst the soldiers of a large army.

Niemann's Tuberculosis-antitoxin.—NIEMANN (*Münch. med. Wochenschrift*, January 19, 1897) has succeeded in isolating an antitoxin from the serum of young goats that had been inoculated with increasing doses of a tuberculin prepared from a virulent culture of tubercle-bacilli. From experiments on guinea-pigs, in which tuberculosis had been produced by inoculation, he claims to have demonstrated that his goat's serum contains an antituberculin.

Animals showing tuberculous ulceration at the seat of inoculation, with tuberculous enlargement of the glands, were cured by inoculating them with the goat's serum, the ulcer healing and the glandular enlargement entirely disappearing. Niemann also obtained good results in the treatment of tuberculosis of moderate severity in human individuals. Under treatment the general condition of the patients showed marked improvement, the tubercle-bacilli disappeared from the sputum, and the cough and expectoration considerably diminished. High elevation of the temperature rarely followed the injection of the serum even in large doses, while albuminuria was never observed.

The Early Stages of Diabetes Mellitus.—LOEB (*Centralblatt für innere Medicin*, Nov. 21, 1896), in an original article, states that it is his opinion that many persons suffering from diabetes eliminate minute quantities of sugar in their urine for long periods, often years, before the symptoms of the disease become sufficiently marked to cause the patient to consult a physician. He has a long list of cases in which patients had consulted him for some minor complaint and in whom he had found minute traces of sugar in the urine. Many of these same patients returned to him years later with large percentage of sugar in the urine and other symptoms of diabetes. One patient, a woman aged fifty-two years, sent her urine for examination and 5.3 per cent. of sugar was found. Two years previously he had examined the urine of this same patient at the time she was complaining of an intercostal neuralgia and found 0.25 per cent. sugar. Loeb at that time regarded the case as one of temporary glycosuria dependent on the intercostal neuralgia. During the two years he had examined the urine every four weeks, and for

nine months it was entirely free from sugar. The final appearance of sugar in such large percentages forced him to consider the case one of true diabetes mellitus. Two or three other cases of similar course are cited. The author, however, does not think that all these cases eventually become cases of true diabetes. One patient, for four and one-half years, had excreted sugar in her urine in quantities varying between 0.22 to 0.40 per cent. At the end of this period the urine was absolutely free from sugar and remained so, even on the ingestion of large quantities of carbohydrates. Loeb thus differs from Ebstein, who believes that all cases with sugar in the urine are cases of true diabetes, whether the sugar be extremely small in amount or even be entirely absent for a time.

Operative Treatment in Typhoid Perforation.—ARMSTRONG (*British Medical Journal*, December 5, 1896), after reviewing the literature, finds that surgeons are directly interested in about 1 per cent. of all cases of typhoid fever; that about 1.2 per cent. of typhoid cases are complicated by perforation of the intestine, and that nearly 6 per cent. of all deaths from typhoid are due to the latter cause. Perforation is commonest during the second, third, and fourth weeks, and is usually single. In discussing the subject of the mortality of typhoid fever he states that Fitz reported 17 cases of spontaneous discharge of pus in typhoid ensuing after symptoms of peritonitis. Nine of these recovered, 7 died, and in 1 the result was not stated. The pus discharged into the intestine in 13 cases, into the vagina in 1 case, through the abdominal wall in 2 cases, and at the navel in 1 case. Armstrong does not think that the diagnosis of perforation is as easy and the symptoms as distinct in many cases as text-books would lead us to suppose. Perforation having been recognized, the patient should be given opium to relieve the pain and arrest peristalsis, thus favoring the formation of adhesions and as much as possible preventing the spreading of the intestinal contents throughout the abdominal cavity. Artificial heat should be applied. With regard to the subject of laparotomy in typhoid perforation, the author thinks that if there is clinical evidence that the perforation is in the colon or that the peritonitis is likely to remain localized, one should wait for abscess-formation. On the other hand, if the evidence is in favor of perforation having taken place into the peritoneal cavity, laparotomy with closure of the perforation, thorough irrigation of the peritoneum with salt-solution, and free drainage are indicated. This should not be undertaken until the condition of collapse passes off. Including a few cases of doubtful diagnosis, laparotomy has been performed in 30 cases, with 6 recoveries. Excluding cases of doubtful diagnosis and including only early laparotomies, there have been 23 operations reported, with 4 recoveries. Armstrong and his colleagues had operated on six cases. Three of these were operated on by himself. All had terminated fatally with the exception of one of his own cases, which was still under observation, but in which there were good chances of recovery.

A Study of the Usefulness of Bianchi's Phonendoscope.—EGGER (*Münch. med. Wochenschrift*, No. 45, 1896), after a careful study of the practical usefulness of Bianchi's phonendoscope, obtained results that do not accord fully with those claimed by the inventor of that instrument. He objects to the

instrument, in the first place, on the ground that even the slightest shaking of the rubber conducting-tubes produced very distinct accessory sounds that were conducted to the ear, thus tending to obscure the heart- or lung-sounds. On the other hand, the very slightest manipulation of the metal rod that rests on the surface of the body causes a noise in the ears so intense as to be painful. Bianchi held that with the use of the phonendoscope all sounds, normal or adventitious, when they reached the ear, had the same intensity and quality which they possessed at their point of origin. Egger believes this to be untrue in many cases. In a tuberculous patient with lung-cavities an examination by direct application of the ear to the chest or by the use of the ordinary stethoscope showed pure amphoric breathing and exquisite metallic râles. On using the phonendoscope the amphoric character of the breathing and the metallic character of the râles were entirely lost, and only bronchial breathing could be made out. He convinced himself that high-pitched notes were much more poorly conducted than with the naked ear or with the ordinary stethoscope. Low-toned notes, on the other hand, were much better conducted. Bianchi claimed that the note obtained while rubbing the skin slightly during auscultation over an air-containing organ is different from that obtained over an organ not containing air. He was thus able to map out the outlines of the heart and liver. Egger is doubtful whether results thus obtained can be fully relied on, as he was able to get marked variations in the note while auscultating over various parts of the thigh. He does not believe that the phonendoscope will displace the stethoscope in clinical work.

SURGERY.

UNDER THE CHARGE OF

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Gonorrhœa in Prostitutes.—To determine the value of microscopical examination in the detection of gonorrhœa in prostitutes WOEDENSKY (*Ruskafa Medicina*, 1894, Nos. 9–11; *Fortsch. der Med.*, 1896, B. 14) examined 306 prostitutes with the following results: cervicitis was found in 58.5 per cent. of cases; of these, 41.5 per cent. had other forms of gonorrhœal infection. In 17 per cent. the uterine secretion was pure mucus; in 82.7 per cent. more or less purulent. Gonococci were found in 27.7 per cent. of the purulent secretions, and in 11.32 per cent. of the pure mucoid, or cases which would have been clinically undetected. The 41.5 per cent. of cases

which had other forms of infections, in 127 cases, 93 had urethritis, which in 39.8 per cent. contained gonococci. Guerin's paraurethral lacunæ were infected in 22 cases, but only one of these contained gonococci. In 18 cases Bartholinitis was present, 72.2 per cent. of cases showing gonococci.

Parenchymatous Injections of Carbolic Acid in Tonsillar Disease.—The frequently recurring attacks of suppurative disease of the tonsils has led KRAMER (*Cent. für Chir.*, November 21, 1896) to the conclusion that this recurrence, which is so persistent in such large numbers of cases, is really due to the presence in the tissues of the gland of bacterial spores, which are evidenced by some fresh exciting cause or condition to a new activity. His observations on a large series of cases confirmed this opinion and led him to try to destroy these spores by parenchymatous injections of carbolic acid.

For this purpose he employed, a few weeks after the recovery from an attack, the injection, by means of a sterilized hypodermatic needle, of a 2 to 3 per cent. solution of carbolic acid. The amount employed was nine minims injected two or three times a week, the treatment comprising four to six doses.

The point selected for injection was cocainized, the needle introduced, and, if no blood could be withdrawn, the injection made, pushing the needle in different directions and distributing the whole amount over a limited area.

The later injections were made each time in some new point.

The patients were all full grown. Very little pain was felt; only a slight difficulty in swallowing, which lasted for a few hours. No marked general symptoms were noted, or the slightest sign of poisoning. The local swelling in the part disappeared shortly, without the production of an abscess or other complications. Patients who had previously experienced a number of relapses previous to this method of treatment were entirely freed from further attacks, fifteen patients having had no relapses during two years and a half since treatment, while many others had had no relapses, although the treatment was of late date.

Argonin in the Treatment of Gonorrhœa.—JADASSOHN (*Archiv für Dermat. und Syph.*, Heft 1 and 2, Bd. xxxii.) comes to the following conclusions regarding the use of argonin in the treatment of gonorrhœa: 1. It is, as experimental and clinical observation have shown, on account of the absence of any coagulative action on albumin, a rapidly acting gonococcicide (usually employed in a 1.5 to 2 per cent. strength). 2. On account of its non-irritant and non-corrosive properties it commends itself in the treatment of acute gonorrhœa of the anterior and posterior urethra in the male and the urethra and uterus of the female. 3. It apparently has no astringent action, and therefore is not adapted to the treatment of simple urethritis.

Osteoplasty on the Foot.—BAYER (*Cent. für Chir.*, December 27, 1896) describes an operation which BARDENHEUER performed for the restoration of the two anterior supporting points of the foot.

In the first case there had been a destruction of the distal portion of the first metatarsal bone and the proximal portion of the first phalanx of the same toe. The operation performed was the removal of the necrosed portion of bone, the cutting of the lateral ligament of the metatarso-phalangeal

joint of the second toe, the displacement of the metatarsal bone inward, and the attachment to it of the remaining portion of the proximal phalanx of the great toe. The metatarsal bone was held in place by gauze-packing, which was gradually replaced by granulation-tissue, preventing its return to its normal position. A silver-wire suture united the fragment of the phalanx to the distal end of the metatarsal bone. The point of support in the plantar triangle, which is the distal end of the first metatarsal, was thus replaced in this case by the end of the second metatarsal. The patient made a reactionless recovery, and was enabled to walk steadily and without pain.

In the second case there was a destruction of the fifth metatarsal bone, and therefore the other anterior support of the foot was destroyed—that is, the head of this bone. The disease was of tubercular origin. The necrosed portions of bone were removed, and then the head of the fourth metatarsal bone was detached from its tarsal ligaments and displaced outwardly to replace the head of the fifth, which had been destroyed. It was retained in position by sutures and by gauze-packing and the formation of granulations in its former position.

The healing was apyretic and rapid; the patient recovered the entire use of the foot and could walk and go upstairs without pain. The functional result obtained in these cases was of great value, restoring ease and stability in walking and doing away with cumbersome apparatus.

Safeguards in Chloroform-administration.—Arnold (*British Medical Journal*, December 12, 1896) calls attention to the fact that a patient may take in a sufficient quantity of chloroform-vapor in one or two deep inspirations, over which the anæsthetizer has no control, to endanger the centres of respiration. He therefore advises the use of an inhaler, which regulates the amount received by the patient. The secret of safe administration, then, lies in the following two points:

1. A very gradual increase supplied to the patient while putting him under. If this be carefully regulated, so that the quantity of vapor reaches the maximum by almost imperceptible degrees, two disagreeable and dangerous symptoms (struggling and vomiting) are almost invariably done away with. This is attained by attending to the amount of compression given to the bulb. At the start, during several respirations, only the slightest compression is used. A slightly deeper compression of the bulb is made for several ensuing respirations, and so on until a full compression is reached, which is kept up until the reflexes are abolished.

2. Once the patient is under the amount must be reduced to the minimum, or something approaching it, and by continuing to supply him constantly with this minimum dose complete anæsthesia may be maintained continuously for hours with perfect safety.

Congenital Dislocation of the Hips.—As an illustration of the diagnostic value which the x-ray possesses, the case reported by Smith (*British Medical Journal*, December 12, 1896) is noteworthy.

The patient was first seen by him at the age of two years; he made a diagnosis of dislocation of both hips, but was inclined to believe that

the acetabula were normal, as also the heads of the femora, and that the dislocation had taken place during delivery by the breech.

The diagnosis was not confirmed and the dislocations were not reduced. Skiagraphs by Rowland have lately shown that the acetabula were normal and that the heads of the femora were normal, so that the former diagnosis was substantiated; and it is probable that, if the attempt had been permitted, the dislocations would have been reduced and the patient would have useful joints without deformity.

Operative Treatment of Phlegmons of the Posterior Mediastinum.—OBALIASKI (*Wiener klin. Woch.*, December 10, 1896), after reviewing the history of these operations, reports five cases of his own, making in all a total of thirteen cases which had the similarity that in all a resection of the ribs was made near their spinal articulation and the costal pleura dissected up from the heads of the ribs and the thoracic vertebræ, thus permitting an access to the vertebræ themselves or to the posterior mediastinal space. The shape of the incision the author does not believe is essential. The dissection of the costal pleura from the bone was successfully performed, with the exception of two instances in the living patient, in which the author tore the costal pleura and produced a traumatic pneumothorax; the wound was, however, closed with sterile gauze; during the remainder of the operation no infection ensued, and the only result was a pneumothorax, which was not purulent and passed off in one or two days after the operation.

As special indications for this operation the author gives: *a*, a cervical abscess which leads down into the posterior mediastinum or is the outgrowth of a mediastinal abscess; *b*, an abscess originating near the spine; *c*, a fistula in the lumbar or thoracic region; *d*, a foreign body in the œsophagus whose exact location we know—that is, into which wall it has penetrated.

The Treatment of Syphilis by Intravenous Injections of Mercury.—LANE (*British Medical Journal*, December 12, 1896) reports the results of treatment by this method. He employed a 1 per cent. solution of the cyanide of mercury, using twenty minims or about one and one-quarter grammes, though in some of the more severe cases he commenced with double the dose for the first one or two injections. At first the injections were employed every other day, but after a short time he introduced them daily. The method of employment is the following: A loop of bandage is first tightly applied around the upper arm, and selection is made of a prominent vein in the neighborhood of the elbow-joint; the skin is rendered aseptic and the needle thrust into the vein, the syringe, filled with solution, being attached to it; the bandage is removed, and the syringe emptied into the vein and then rapidly removed.

The advantages of intravenous injections he summarizes as follows: they are absolutely painless, in which respect they are in direct contrast with intramuscular injections; the functions of the digestive tract are not interfered with; the doses of the mercurial salt are small, are certain of absorption, and can be easily regulated to the varying susceptibilities of different individuals; with ordinary precautions the treatment is perfectly safe, and even if the vein is missed little or no inconvenience is caused thereby; the resulting

improvement is certain and rapid, and consequently it would seem to be indicated in cases of cerebral syphilis; his experience does not warrant him in offering an opinion as to whether this treatment is followed by relapses, but so far he has not met with any. The only real objection he can see to the method is the difficulty experienced in some cases of bringing the veins into sufficient prominence, and in a certain proportion of cases, especially among women, this is an insuperable obstacle. In conclusion, he believes that in intravenous injections we have a valuable addition to our antisyphilitic therapeutic agents, though the plan is one which obviously cannot be recommended as a routine in practice.

Tuberculosis Verrucosa Cutis.—MOYNIHAN (*British Medical Journal*, November 20, 1896) describes an interesting case of this rare manifestation of tubercular disease, which is due to the local and primary inoculation of the tubercle.

The patient was a girl, aged twenty years, who had cut herself three months previous to observation on the dorsum of the right hand. The cut refused to heal and the inflammation extended; she had done washing in which there were handkerchiefs of a tuberculous patient. The wound was probably infected from this source. The ulcer was removed with a wide margin of healthy tissue, and healed permanently and rapidly.

The microscopical section showed much disturbance of the epithelium, owing to the chronic inflammatory exudation in the underlying cutis. The epidermis is thickened and varicose, and the underlying round-cell infiltration is arranged in foci resembling those of tuberculous inflammation. In some of these a giant-cell, with numerous nuclei of the tubercular type, may be seen. The lesion is doubtless of a tubercular character.

The Technique and Indications for Resection of the Rectum in Case of Cancer.—DEPAGE (*Rev. de Chir.*, November 10, 1896) gives the following as the technique he employs in cases of cancer of the rectum:

1. The patient is placed in the gynecological position, in such a manner as to give to the pelvis a vertical direction. An incision is made on the posterior aspect of the pelvis, and the coccyx and one or two sacral vertebræ are resected if it is necessary.

2. The dissection of the rectum, care being taken to leave as much of the cellular tissue and peritoneum adherent to it as possible, finally preserving the superior hemorrhoidal artery in order to maintain the nutrition of the superior portion and to remove the cancerous tissues *en masse* with the lymphatics involved by the disease.

3. Closure of the peritoneal cavity immediately after the resection of the intestine and the removal of the neoplasm.

4. Drawing down of the superior segment of the anus after having invaginated it into the inferior segment, even for cancers situated high up. There is no danger of gangrene of the intestines if care is taken to preserve the superior hemorrhoidal artery.

In one case, however, gangrene occurred, but this case supported the view already expressed, for after the removal of the necrosed tissue he found the superior segment and united it to the anus, without in this instance leading to gangrene and necrosis.

The fifth step is tamponing or suture in layers.

The author does not use the palliative iliac artificial anus except under two conditions:

1. Where operation is urgent and the general condition of the patient is bad.

2. If the cancer is so extensive that the sacrifice of the entire rectum is necessary.

The author obtained in ten cases eight recoveries. One case was seen three years and a half after operation, one a year and a half after, while two died from return of the disease one year after the operation. The others have been operated upon too lately to be of value statistically. Relapses are more rare and later in disease of the rectum than in cancer of any other portion of the body.

As indications the author says that at the beginning of the disease the radical operation is imperative; later, when the lymphatics are involved, the radical operation or an artificial anus, according to the extent of the involvement and the condition of the patient. Later, when extirpation is impossible, the artificial anus is the only and temporary relief.

Gastrectomy.—PÉAN (*Rev. de Chir.*, November 10, 1896) reported to the French Surgical Congress the results he has obtained in operations of this character. In 12 pylorectomies for cancer he had 4 deaths; in 3 gastro-enterostomies, 1 death. Outside of cancerous disease all his other operations were successful—4 pyloroplasties and 4 excisions of ulcers.

Within the last twenty-five years the following operations have been employed against this disease: pylorectomy, gastro-duodenostomy, the radical operations, and gastro-enterostomy, a palliative operation.

Pylorectomy is indicated in young persons who are still resistant, where the tumor is small, mobile, and has not produced lymphatic and visceral metastasis.

In every case where the first portion of the duodenum alone is involved, and it is possible to resect the diseased portion of the stomach and yet retain a small portion of the cardiac end, the surgeon may interfere; but instead of attempting to unite the duodenum to the large opening in the stomach, this should be sutured in different planes, and the duodenum united to the nearest portion of the stomach, preferably by a Murphy button.

In case of marked cachexia or lymphatic involvement one should be contented with a gastro-enterorrhaphy with a Murphy button.

A New Operation for Gastrostomy.—FONTAN (*Rev. de Chir.*, November 10, 1896) gave the following as the steps in a new operation which he has employed successfully, and which has for its object the avoidance of erosion, the infiltration of surrounding tissues, etc., due to the escape of the gastric juice. This method simplifies other methods for the formation of valvular openings, and the author terms it the valvular procedure. First, the ordinary epigastric incision; second, the seizure of the stomach with a pair of toothed forceps and the production of a hernia of considerable size

third, the suturing of this fold to the edge of the wound; fourth, the invagination of the fold, the forceps still remaining in the position, and the suturing together of the serous surfaces at the ends of the wound; fifth, the incision of the stomach-wall by a bistoury passed along the forceps and the insertion of a canula.

The canula is thus placed in a valvular opening formed like an inverted bishop's mitre, with the walls of the stomach forming its gastric surface, while the serous surfaces are opposed to each other. The results obtained are perfect, no contents or gastric juice escaping through the valve thus formed.

Radical Cure of Hernia without the Use of Buried Sutures.—DUPLAY and CAZIN (*La Sem. Méd.*, November 11, 1896) having seen late abscess-formation as the result of the use of buried sutures, believe that they form a *locus minoris resistantiæ*, and that however aseptic they may be a systemic septic infection is liable to show itself at that point. They therefore advise the performance of an operation without the use of buried sutures, and accomplish this by tying the sac upon itself, after having drawn it well down, and to prevent this knot from slipping they tie a series of knots in the sac, or divide it and tie the two portions together, one knot upon another.

The parietal sutures and those employed to occlude the external ring are of silver wire, and are removed after union has taken place.

A series of twenty operations performed in this manner have yielded results as perfect as could be desired, with no recurrences and no abscess-formation.

The Treatment of Spasmodic Torticollis by Kocher's Method.—DE QUERVAIN (*La Sem. Méd.*, October 14, 1896) strongly advocates Kocher's method, which he describes as follows: 1. The section of the sterno-cleido-mastoid. The head of the patient, while under an anæsthetic, is turned from the operator and an incision is made two to three inches in length, commencing at the anterior margin of the sterno-mastoid at a point near the angle of the inferior axilla and extending upward to an inch below the mastoid, following the normal wrinkles of the neck; the author insists upon this, as it enables one to leave a scar that is scarcely noticeable. The platysma myoides is then divided, avoiding the external jugular vein and the cutaneous nerves of the region, if possible. The superficial aponeurosis of the sterno-cleido-mastoid is then incised on the anterior border of the muscle. A grooved director is then introduced and the muscle divided layer by layer.

2. The section of the cervical muscle. With the patient anæsthetized and placed on the side opposite to the one to be operated on, a transverse incision is made extending from the mastoid eminence to the median line of the neck posteriorly. After resection of the superficial aponeurosis the occipital portion of the trapezius is exposed, which is divided transversely; this discloses the splenius and more deeply the greater and less rhomboideus. These three muscles are divided, avoiding the great occipital nerve which passes at this point through the rhomboideus major and the trapezius. Here there is found, after the resection of these other muscles, the inferior oblique, which must likewise be divided.

The author summarizes his opinion regarding these operations as follows: the section of the affected muscles produces not only a palliation, but also a cure of torticollis, susceptible of producing favorable results in all cases that are treated individually and persistently, and is incontestably a marked step in advance in the surgical treatment of spasmodic torticollis.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Illumination.—Dr. Walter F. Chappell (*New York Medical Journal*, 1896, No. 938) has devised a shade for the Welsbach light for use without a condenser. "It consists of a section of iron or aluminum tubing, nickel-plated on both sides, and of sufficient diameter to fit over an ordinary (one-piece) mica chimney or standard. A rim is turned up on the lower end of the shade and rests on the supports which carry the chimney. The opening in the shade corresponds in size and shape to the mantel of the Welsbach light, and admits of direct, steady light without any side-glare or reflections."

Amygdalotomy.—Dr. J. Homer Coulter, of Chicago (*New York Medical Journal*, 1896, No. 938), recommends dissecting the palatine folds half-way off from the tonsil with a small electric cautery; then drawing the tonsil forward and dissecting it out thoroughly to about one-half its extent, cutting this portion off, and treating the surface with a strong solution of silver nitrate. The other portion of the tonsil is to be removed in the same manner a week or ten days later.

Hypertrophies of the Turbinates.—Dr. Norval H. Pierce, of Chicago (*New York Medical Journal*, 1896, No. 938), practises submucous linear cauterization in the following manner: a small incision is made in the hypertrophied membrane through which a blunt, flat probe is introduced, and the membrane carefully separated from the erectile tissue beneath. Then a few crystals of chromic acid are fused upon the cup-shaped end of a sound and this is inserted into the track previously made by the probe, so as to cauterize the tissue.

Papillomatous Vegetations in an Infant of Two and One-half Years.—Dr. Delie reports (*Revue Hebd. de Laryngologie, d'Otologie, et de Rhinologie*, 1896, No. 42) a case in which a well-nourished and well-colored child had no other symptoms of disorder except painful and prolonged respiration, sonorous and active in both phases. The dyspnœa was worse at night and interfered with sleep.

On inspection of the mouth the entire isthmus was seen to be occupied by papillomatous vegetations from one-half millimetre to one millimetre in thickness, and from two to three millimetres in length. They were fleshy, slightly rose-tinted, glistening, and covered with epithelium, and they were firm to the touch, which did not provoke pain or bleeding. These compact villosities occupied the entire anterior face of the soft palate, and extended for a centimetre upon the mucous membrane of the hard palate. They occupied the anterior palatine folds as well as the posterior palatine folds, a portion of the tonsils, and the lateral walls of the pharynx. The rhinopharynx was free, as well as the superior face of the soft palate. Laryngoscopy revealed similar neoplasms descending laterally toward the pharynx. The epiglottis was free, but the ventricular bands were affected with the pathological process, where the vegetations were smaller, finer, and softer, less compact, less elevated, and larger than those of the throat, entirely masked the entrance into the larynx, and produced the constriction which was the cause of the respiratory stridor. No ulceration was seen anywhere. Numerous ganglions occupied the maxillary and the hyoidean regions. The infant presented no other phases of disease whatever. It had had a tenacious coryza at the age of three months, and had been querulous, pale, anæmic, and feeble up to the age of fifteen months.

Before this child had been born the mother had given birth to a stillborn infant at seven months, but she could not recall having ever been ill herself. Her eldest son, however, sixteen years of age, had some syphilitic vegetations of the anus.

The diagnosis was syphilitic vegetations. The treatment was iodized wine in progressively massive doses. Amelioration became manifest on the fifteenth day, and progressed to complete cure at the end of four months. During the regression of the vegetations it was found that the interarytenoidean fold and the laryngeal face of the arytenoids had participated in part in the syphilitic neoplasia.

Laryngeal Tuberculosis.—At a meeting of the Laryngological Society of London, December 9, 1897 (*Journ. of Lar., Rhin., and Otol.*, February, 1897), microscopic specimens of a pedunculated tuberculous growth of the vocal cords were shown by Dr. Adolph Bronner.

"The larynx was in other respects apparently normal. The patient had been suffering from pulmonary phthisis for over two years, and had been hoarse for a few months. There was a small red, regular, pedunculated growth on the edge of the left vocal cord. This was removed with forceps. The patient died about a year later. There was no further history of hoarseness, and the larynx apparently remained normal up to death."

The Clinical Research Association reported as follows:

"The growth is composed of vascular connective tissue, like granulation-tissue, in which are imbedded the acini of mucous glands. There are one or two giant-cells beneath the mucous membrane, which are probably indicative of the tuberculous nature of the affection."

Dr. McBride referred to the German literature, where such growths were mentioned by Avellis and others as tuberculous tumors simulating fibromata and papillomata.

Recurrent Fatty Tumor of Epiglottis.—Dr. P. McBride reported this case to the Laryngological Society of London (*Journ. of Lar., Rhin., and Otol.*, February, 1897). It occurred in a man, forty-one years of age, who for some six months had noticed a peculiar sound in breathing. This became troublesome on lying down. There was also some difficulty in swallowing, which required a distinct effort and was accompanied by sound. A pale pink, rounded tumor, seen behind the tongue and found to be attached to the epiglottis, was removed in part with scissors and in part with incandescent snare. Eighteen months later recurrence had taken place to the full size of the growth removed. This was removed with the incandescent snare during traction with forceps, thus enucleating the mass.

Immunity for eight years followed, and then there was recurrence again, the growth becoming so large in six or eight months as to obscure the larynx.

This growth was removed with the use of the incandescent snare, aided by traction with the vulsellum. The heated wire cut through the capsule and the deeper portion came away by enucleation. Hence Dr. McBride concludes that traction should always be exercised in these fatty tumors during the time the capsule is being burned through with the incandescent snare.

Photography of the Larynx and Posterior Nares.—Dr. Thomas R. French, of Brooklyn, describes (*New York Medical Journal*, 1897, No. 947) his present method of laryngeal and post-nasal photography with the aid of the arc light, and illustrates his article with cuts of the apparatus and of various images.

While these results might fail to elicit the artistic appreciation of the novice, they are exceedingly valuable to the real student by reason of their accuracy in depicting the things as they appear from the various restricted points of observation.

Diseases of the Ethmoid.—Dr. John Noland Mackenzie, of Baltimore, presents (*New York Medical Journal*, 1897, No. 947) a contribution to the pathological anatomy of ethmoid disease, which is illustrated with a series of microscopic drawings illustrating some of the special points to which he calls attention. This article appears, likewise, in abstract in the *Journal of Laryngology* for February, 1897.

Fatal Rapid Destruction of Nose and Face.—Dr. McBride reports (*Journ. of Lar., Rhin., and Otol.*, February, 1897) this case in a house-painter, twenty-eight years of age; the lesion having begun with a scratch inside the nose. Syphilis, tuberculosis, glanders, and noma were excluded from the diagnosis, which remains undetermined.

Papilloma of the Larynx; Cancerous Degeneration; Laryngectomy; Death.—In the *Boston Medical and Surgical Journal*, 1897, No. 3, Dr. J. L. Goodale reports this case as one of cancerous degeneration of a laryngeal papilloma following operation.

To sum up: a male, aged sixty-four years, with negative clinical history, complained in March, 1894, of a hoarseness of several months' duration.

This was shown to be due to "a pea-sized, sessile, papillomatous growth, situated on the free margin of the left vocal cord at the junction of the anterior and middle thirds." The tumor was removed by Dr. J. Payson Clark and pronounced by the Massachusetts Hospital pathologist to be a benign growth, being "a small, vascular, and fibrous mass covered by flat epithelial cells."

After the operation the patient escaped observation until April 22, 1895, when he returned to the clinic and stated that his hoarseness had persisted more or less, but had not become marked until February, 1895, since which time it had increased rapidly. Examination showed the left cord and ventricular band transformed into a prominent, somewhat oval, reddened, roughly granular, rigid mass, encroaching on the lumen of the glottis and moving slightly on phonation. Right cord replaced by bright red granulations.

The larynx was excised *in toto* by DR. RICHARDSON. When laid open it showed no extension of the disease below the cords or above the ventricular bands. Report of the pathologist, epidermoid cancer. The patient died a week later from pneumonia.

[In view of the result of the collective investigation of Dr. Semon, of London, in which the mass of testimony negatived the opinion that these transformations occur, it is a pity that this case could not have been better studied. It is quite possible that the papilloma originally removed started upon a cancerous basis, especially as the hoarseness of which the patient complained was not relieved by the initial operation.

The compiler has seen instances in which malignant disease of a vocal band progressing inferiorly has been complicated and in part marked by papilloma upon the same side, and has thus thoroughly deceived the physicians first called to the case.]

Extirpation of the Larynx.—At a meeting of the Laryngological Society of London, December 9, 1897 (*Journ. of Lar., Rhin., and Otol.*, February, 1897), several cases were reported.

1. An excision of the larynx and upper two rings of the trachea, for perichondral sarcoma of the cricoid cartilage, by MR. W. G. SPENCER.

2. Total extirpation of the larynx for squamous-celled epithelioma; patient and specimen shown by MR. LAMBERT LACK.

3. Total extirpation of the larynx, with part of anterior wall of pharynx, of posterior of tongue, and glands in neck, for squamous-celled epithelioma, by MR. LAMBERT LACK.

Mr. Lack's operations were performed without preliminary tracheotomy, and the trachea was stitched to the lower transverse incision of the skin, so as to shut off all communication with the wound before the larynx was removed. These cases have done remarkably well. One is quite well; can whisper distinctly and is able to dispense with the tracheotomy-tube. The other one is in good health and has put on a good deal of flesh. He had previously been refused operation in three hospitals.

Mr. Spencer's patient had recovered good general health, could swallow easily, and could hold conversation with the nurses and patients in the hospital. The operation had not been performed with any other view than that of palliation.

OTOLOGY.

UNDER THE CHARGE OF
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Endothelioma of the Outer Ear.—MANASSE reports a case of the above-named disease (*Archiv für Ohrenh.*, vol. xli. p. 6). The tumor in this instance had existed for ten years in the form of a teat attached to the upper part of the auricle of an old woman; latterly ulceration took place in it. It was supposed that the growth had its origin in the lymphatics.

Epithelial Cancer of the Auditory Canal.—MANASSE also reports the occurrence of epithelial cancer in the auditory canal (*Ibid.*). The tumor was removed and permanent cicatrization took place. The typical cells in this case were cylindrical and cubical, whereas usually the cells of epithelial cancer are flat.

Endothelioma of the Middle Ear.—LEUTERT observed an endothelioma of the middle ear, originating in the lower front part of the drum-cavity. This was first considered to be a polypus, but the excessive hemorrhage induced by manipulation led to the diagnosis of endothelioma. The same observer also records his finding in the pedicle of an otherwise benignant nasal polypus a nest of cancer-cells.—*Archiv f. Ohrenh.*, vol. xli. p. 64.

Sarcoma of the Middle Ear.—KUHN reports two cases of sarcoma of the middle ear (*Archiv f. Ohrenh.*, vol. xli. pp. 66–69). In the first case, a man aged thirty-three years, both ears were affected. In the course of two years, beginning with profuse suppuration and the development of malignant growths in each ear, the mouth became inflamed, the teeth dropped out, both eyes exhibited choked disks, the patient broke both legs, apparently from the acquired brittleness of the bones, and finally, with a polyuria, polydipsia, and phosphatic diabetes, death occurred.

In the second case, that of a woman aged forty-three years, it was stated that for two years the patient had suffered from tinnitus aurium, and in her left ear, for this same period, a bluish tumor had been noted. During a year before her examination by Kuhn an otorrhœa had existed in this ear. A small piece of the tumor in the ear was examined, and it was found to be a melanosarcoma. Operation was declined, and the woman withdrew from further observation.

JOEL (*Ibid.*) reports a primary sarcoma of the mastoid in a *child two years old.*

KÜMMEL (*loc. cit.*) claims that the diagnosis of a tumor in the region of the ear may become difficult if the growth suppurates, as the disease then resembles a simple suppuration of the middle ear or mastoid process.

BERTHOLD (*Ibid.*) claims that a choked disk is of diagnostic value only when it is permanent, in cases like that referred to by Kuhn.

KUHN (*Ibid.*) replied that in this case in both eyes there was choked disk, with very indistinct boundaries and inequalities in surface. He considered the phenomenon in this case as due to increased pressure within the brain, which was attributable, however, rather to the sarcomatous growth at the base of the skull than to the ear-tumor.

SCHUBERT (*Ibid.*) claims that simple capillary and venous congestion of the optic papilla without œdema of the retina must be carefully distinguished from a choked papilla with indistinctness of the boundaries and extensive projection into the vitreous chamber. The first form permits no sharp conclusion as to the nature of the intracranial process, and may occur with simple otitis in cases which spontaneously heal. The choked disk, however, nearly always accompanies a process encroaching upon the cavity of the cranium.

Carcinoma of the Petrous Bone.—DANZIGER (*Archiv f. Ohrenheilkunde*, vol. xli. part 1) reports two cases of the rare disease, carcinoma of the petrous bone. Both proved fatal. In the first case, an unmarried woman aged fifty-four years, the cancerous disease was preceded by forty years of purulent otorrhœa on the side finally affected with carcinoma. In the second case, a man aged fifty years, no ear-disease had ever existed. A glandular swelling behind the auricle following grippe two years previously had been treated by some kind of salve by an irregular practitioner, from the irritation of which the carcinomatous disease seemed to begin and spread inward. Facial paralysis occurred in both cases, and both cases had passed through severe influenza before the cancerous disease developed. The lesions in the brain, however, were very different. The tumor in the first case was soft and resisted by the meninges, whereas in the second case the tumor was firm and extended freely into the cranial cavity, pressing upon the brain, especially upon the superior temporal gyrus, producing aphasia.

Solitary Tubercle of the Seventh and Eighth Cranial Nerves.—MANASSE (*Archiv f. Ohrenh.*, vol. xli. p. 62) exhibited a specimen of the above-named nature, removed from a phthisical patient, aged forty-three years, who had become deaf in the left ear, while the drum-membrane remained normal. Facial paralysis with marked degenerative reaction was observed also on the left side.

The autopsy revealed in the posterior part of the left pons a firm tumor the size of a hazelnut, in the centre of which was a cavity filled with a friable, cheesy mass. Both the facial and acoustic nerves were imbedded in this mass. A second tumor, placed close to the first, reached as far as the surface of the cerebellum and projected above the pia mater the length of a bean. On the surface of this latter tumor the vagus, the glossopharyngeal, and accessorius nerves were quite firmly adherent. Some other tubercles were found in the cerebellum and in the right occipital lobe.

Fibrosarcoma of the Acoustic Nerve.—ANTON reports an occurrence of fibrosarcoma of the acoustic nerve in a man, aged fifty-five years (*Archiv f. Ohrenh.*, vol. xli. p. 61). The patient was seized with headache and blindness of the right eye, and in three hours later with blindness of the left eye. At times he vomited, and he suffered from roaring and hissing sounds in his

ears and hardness of hearing. Optic neuritis occurred on both sides and facial paralysis on the right. Death occurred eight months after the first symptoms. The autopsy revealed a tumor the size of a hen's egg, rather soft, with rough surface, situated between the pons and the cerebellum. The origin of the nerves on the left was normal; on the right side the fifth, the seventh, and the eighth nerves ran on the under surface of the tumor and then over it.

The seventh and eighth nerves were imbedded in the tumor and accompanied by the morbid tissue as far as the internal porus acusticus. The position of the right abducens and of the ninth, tenth, and eleventh cranial nerves was altered.

The same writer reports the accidental discovery of a similar kind of tumor at the autopsy of an old man. The growth was the size of a nut and rough, connected with the left acoustic nerve and extending as far as the internal porus acusticus. The acoustic and the facial nerves were separated by the tumor, but connected by a bridge of partly degenerated medullary fibres.

In both cases the fibrosarcoma originated from the sheath of the acoustic and partly from that of the facial nerve.

Thrombosis of the Lateral Sinus.—DENCH and ADAMS record successful operations for the relief of otitic thrombosis of the lateral sinus.—*Trans. Amer. Otol. Soc.*, vol. vi. part 3.

The case reported by Dench was that of a young man, aged eighteen years, who had suffered for a short time from acute otitis media. He had been seized suddenly with earache, which gradually spread backward over the mastoid. He had also suffered from vertigo and nausea. On the fifth day of the disease the auditory canal was found to contain a scanty, seropurulent discharge; there was so-called prolapse of the upper posterior part of the membrana tympani and canal-wall, indicative of defective drainage of the antrum; slight mastoid tenderness; temperature 101° F. The drum-membrane was freely incised and the ice-coil applied to mastoid; but twelve hours later the patient was seized with a chill and the temperature rose to 105.8° F. There were severe headache, delirium, and incontinence of urine and feces. The temperature fell spontaneously in a few hours to 99° F., and then in a few hours it began to rise again and became 103° F., though the patient complained only of headache.

Toxic infection of the lateral sinus was diagnosticated and the patient immediately operated upon after being suitably prepared.

The mastoid cavity was first opened with the chisel, the pneumatic spaces found filled with foul, cheesy matter, and the "free use of the curette showed that the internal table had been entirely destroyed, exposing the meninges." The lateral sinus was plainly seen in the exposed meningeal area, and was found by the exploring-needle to be empty. The sinus, on being opened, was found to contain a fibrinous clot, which was removed by the curette; no hemorrhage followed this procedure. The sinus was exposed and cleaned out to within a quarter of an inch of the bulb of the jugular. Pressure upon the jugular in the neck, coupled with passing a curette through the sinus toward the bulb of the jugular, was followed by a flow of blood. The sinus was then irrigated with normal salt-solution and the wound tamponed with iodoform-

gauze. The sinus was next followed in the opposite direction toward the torcular; the curette brought away a firm, fibrinous clot, and finally there was a free hemorrhage. The entire wound was then firmly packed with iodoform-gauze and the dressing allowed to remain in position five days. The temperature did not rise above 99°, and recovery promptly ensued.

In Adams's case (*loc. cit.*) the patient was a young woman, aged twenty-four years. It would seem that the bad treatment of the acutely inflamed ear by means of hot onion-poultices, etc., before Adams saw the case, led to secondary infection of the ear and phlebitis and thrombosis of the lateral sinus. The symptoms, both general and local, and the operation for exposure of the mastoid and middle-ear cavities were similar to that pursued in the case first detailed. The mastoid cavity was found to contain pus and cholesteatomatous material. This was carefully curetted away and the cavity thoroughly cleansed with a solution of bichloride (1 to 5000). The sinus was then uncovered by removal of the inner table of the mastoid with chisel and rongeur forceps. A small quantity of pus was seen to escape from the sigmoid groove. This space was washed thoroughly with a bichloride solution (1 to 5000), and then the sinus, which seemed to pulsate, was explored, but seemed to contain no blood. It was then laid open for three-quarters of an inch, and found to contain a cord-like, dry clot. This was removed from the tract toward the torcular until fluid blood appeared. The contents below were removed for a distance as far as the curette could be introduced, but no fluid blood could be obtained from this side. The sinus was irrigated with normal salt-solution and packed with iodoform-gauze. The upper part of the wound was sutured and the whole covered with antiseptic dressings. Recovery took place in three weeks.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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Arrest of Hemorrhage after Enucleation of the Eyeball.—SIMEON SNELL (Sheffield, Eng.) has for several years used hot water in controlling the hemorrhage following enucleation of the eyeball.

Immediately after the conclusion of the operation, and while the patient is under the influence of the anæsthetic, the parts are dried as much as possible with a pledget of cotton-wool, and then a roll of cotton-wool which has been dipped in very hot water is immediately plunged into the socket. Bleeding will often be arrested at once; but, if necessary, the proceeding may be

repeated, and then, if the bleeding has not entirely ceased, it will generally amount to no more than a little oozing. The usual pad and bandage may be applied with the eye practically dry.

Another advantage, and one perhaps not less important, is that recovery is promoted and the socket is healed some days earlier than would have been the case if the hot water had not been applied.—*Ophthalmic Review*, vol. xv. No. 180.

Congenital Ophthalmoplegia Externa.—D. GOURFEIN (Geneva) reports six cases of this condition occurring in the members of one family, a father, aged forty-two years, and five sons whose ages were from eight months to twelve years. The mother of the first patient was said to have suffered from the same condition, and a half-sister, daughter of the mother, to have had a convergent squint. The wife of this patient, mother of the boys, was free from any ocular defect, as were also two daughters. There was no trace of evidence of syphilis.

Gourfein traces a sharp distinction between this condition and the more common ophthalmoplegia externa of nuclear origin. In the latter the ptosis is always moderate, the superciliary arch normal. There is no nystagmus, but sometimes protrusion of the eyeball; vision is normal. Micropsia and false projection sometimes exist. The ocular fundus and vision are normal. On the other hand, in congenital ophthalmoplegia ptosis is very marked or complete. The superciliary arch is flattened, there is rotary nystagmus, no protrusion of the eyeball; there is more or less amblyopia, and no micropsia or false projection. In some cases there were lesions of the retina and optic nerve.

He believes that congenital ophthalmoplegia externa is not of nuclear origin, but is clearly a hereditary affection, consisting entirely in defects of the muscles.—*Rev. Med. de la Suisse Romande*, 1896, No. 12.

Removal of Orbital Tumors.—C. S. BULL (New York), in a paper on the course and prognosis of orbital tumors as influenced by surgical operations for their removal, including reports of thirty-six cases, draws the following conclusions:

1. The prognosis of all forms of malignant orbital tumors, whether primary or secondary, is unfavorable; and if the tumor be primarily one of the deep facial bones or their sinuses, the prognosis is positively bad.

2. Except in the case of encapsulated tumors of the orbit, surgical interference is almost invariably followed by a return of the tumor, and the growth of the secondary tumor is more rapid than that of the primary lesion. With each succeeding operation the period of quiescence in the return of the tumor grows shorter and the rapidity of the growth increases.

3. The patient's family, and in certain cases the patient himself, should in the beginning be told of the serious nature of the trouble and be warned that complete removal of all the disease-germs is a well-nigh hopeless task. The burden of the decision as to surgical interference must rest upon the shoulders of the patient.

4. Repeated operations in these cases undoubtedly shorten the life of the patient. While it is, therefore, our duty to operate in all cases, in order to

relieve severe or unbearable pain, we should be slow to operate merely for the sake of relieving temporarily physical disfigurement or deformity, especially if we are convinced that by so doing we shorten the life of the patient, even if that shortened life is rendered more bearable.—*Transactions American Ophthalmological Society*, 1886.

Absolute Alcohol as a Disinfectant for Instruments.—R. L. RANDOLPH (Baltimore) concludes, from an experimental bacteriological study, that in a given number of eye-instruments by far the majority are infected by exposure to the air; that absolute alcohol would seem a valuable disinfectant for instruments infected under the conditions which ordinarily surround us in every-day life; but that the septic character of instruments infected with a pure culture of staphylococcus albus is not altered by exposure for twenty minutes to the action of absolute alcohol.—*Transactions American Ophthalmological Society*, 1896.

Periodic Oculomotor Paralysis.—DR. D'ALCHÉ (Paris) has made a study of the literature of this peculiar affection, and adopts the view of Charcot that it is not a distinct disease, but a grouping of symptoms characterized by hemicrania, with total paralysis of the oculomotor nerve of one side; and that it is closely analogous to ophthalmic migraine.

It occurs usually at the age of twelve to seventeen years, and is equally frequent in both sexes. A neuropathic heredity does not seem to play any important part in its causation.

It is characterized by headache, which is unilateral, though not so distinctly limited as that of hemicrania. In some cases it is terribly severe, but more frequently bearable. It is liable to exacerbations in the morning or evening. The period of headache ends with the appearance of the oculomotor paralysis; sometimes quite abruptly. In other cases there is some overlapping of periods of pain and of paralysis. The attacks occur periodically at intervals varying from a week to a year or more. The recovery is at first complete, then partial, and finally the paralysis becomes constant. For treatment Dr. d'Alché follows Charcot in recommending prolonged use of bromides, with potassium iodide and electricity as adjuvants.—*Gaz. Hebd. de Méd. et de Chirurgie*, December 10, 1896.

Treatment of Detachment of the Retina.—CASEY A. WOOD (Chicago) thinks, with Bull, that we have as yet discovered no better device than that resorted to with occasional success by the older ophthalmologists, viz., rest in bed, bandages, atropine, and the internal use of some absorbent. Instead of the long-continued use of pilocarpine, especially when that drug is ill borne by the patient, we may substitute sodium bicarbonate and potassium iodide, well diluted with water. In all recent cases where the eye is quiet, and there is no vitreous strand to sever, conjunctival puncture of the sclera may do temporary good and vision may be improved. Division of fixed membranous bands in the vitreous may be done without causing much reaction and may prevent extension of the disease.

A large percentage of the results obtained after iridectomy, after removal of the lens, from the use of atropine, bandaging, pilocarpine, etc., even some

cases of cure following posterior operation, are really brought about by local and general rest—by putting patients in such a position that they cannot, by overexertion of any kind, make a bad matter worse. The retina, having meantime broken loose from its connection with the shrinking vitreous, returns to its normal position, and the treatment, medical or surgical, receives the credit.—*Transactions Section on Ophthalmology, American Medical Association*, 1896.

Cocaine in Glaucoma.—GROENOW (Breslau) has no fear as to harm from the employment of cocaine in eyes presenting a glaucomatous condition (*La Semaine Médicale*, 16 Ann. No. 40). He has never seen it do harm; but, on the contrary, its use has often been attended with good results. It diminishes acute pain, lessens the hyperæmia, and does not raise the tension of the eyeball. By its mydriatic effect it allows of the better examination of the eye.

OBSTETRICS.

UNDER THE CHARGE OF

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The Choice of Version or Forceps in Moderate Pelvic Deformity.—In the *British Medical Journal*, 1896, No. 1870, is published a paper by MILNE MURRAY, in which he advocates the use of forceps in cases of flattened pelvis in which the head presents transversely in the pelvic brim. Murray states that the choice of version in these cases has been based upon the belief that the forceps, applied in the antero-posterior diameter of the head, tends to compress it antero-posteriorly, and to cause a bulging of the transverse or biparietal diameter. This would increase the difficulty of extraction, as the biparietal diameter is already brought into relation with the smallest diameter of the pelvic brim. Murray doubts the truth of this belief, because he has shown by experiment that when the head is grasped over the occiput and forehead that the occipito-frontal diameter may be compressed one and one-half inches without increasing the biparietal. A vertical and not a transverse expansion results. The various segments of the cranium slide under each other in a telescopic manner.

To succeed in delivering the fœtal head presenting transversely in the brim of a flattened pelvis the forceps must not only grasp the head in its antero-posterior diameter, but must also make traction downward and backward in the axis of the pelvis. The head naturally passes through the brim, in these cases, by an exaggeration of Naegele's obliquity, by which the posterior parietal eminence pivots against the promontory of the sacrum, while

the anterior moulds itself against the pubes. Murray stated that he had delivered living children where the antero-posterior pelvic diameter was three and one-quarter inches, and even as little as two and three-quarters inches. To secure perfect axis-traction he has attached to his forceps a handle which is movable upon a right-angled traction-bar; by this means he can vary the direction of his traction to suit the abnormalities of the pelvis.

In discussion, FOTHERGILL and CAMERON agreed essentially with Murray. KERR thought that success in such extractions was obtained by rotating the head obliquely into one of the oblique diameters of the pelvic brim. He thought that it is rare to find the two halves of a pelvis of equal size, and that in difficult labor the head will enter the larger portion of the pelvis. He believed that the head rarely passed through the pelvic brim in a strictly transverse position.

(The editor, from his experience, is inclined to indorse the views of Dr. Kerr on this question. While it is no doubt possible to deliver the head in many cases as Dr. Murray indicates, still in many others the head moulds itself into an irregular, oblique position. The suggestion of Dr. Murray that the line of traction should be strongly backward as well as downward is most valuable. In a recent case, in a flat pelvis where the first child had been lost by pressure, and where others had failed with forceps, success was achieved by putting the patient in Walcher's position and by making traction in exaggerated downward and backward direction. A living child was delivered with Simpson's forceps, axis-traction being effected by the use of tapes.)

Successful Cæsarean Section upon a Rhachitic Patient, Performed at Her Home.—In *Le Progrès Médicale*, 1896, No. 46, BÈCHET reports the case of a woman, aged thirty-eight years, having a highly contracted rhachitic pelvis, who had been in labor at intervals during three days when he was called to attend her. The head of the child was evidently large and could not descend into the pelvis. The mother was in fair condition, without infection, and her excretion fairly well performed. Symphysiotomy was declined because of the high degree of pelvic contraction, and the Cæsarean section undertaken. This was performed in the usual manner, the placenta being found beneath the line of incision and some hemorrhage occurring when the uterus was opened. This was controlled by injections of ergotin and the application of gauze-pads wrung out of hot, sterile water. The muscle of the uterus and its peritoneal covering were sutured separately and with great care, and the abdomen closed. The patient made an uninterrupted recovery. This case illustrates the fact that the Cæsarean section may be successfully performed without the advantages afforded by a hospital.

Studies in the Blood of the Newborn.—In the *Wiener klinische Wochenschrift*, 1896, Nos. 41 and 43, are published two very interesting papers, one upon "Melæna" and the other upon the "Condition of the Red Blood-cells in Cases of Icterus Neonatorum." The first paper is by SWOBODA, one of the physicians to the Vienna Foundling Asylum. In this paper he narrates a number of cases of infants dying with passive hemorrhages from the nose,

mouth, and intestine. In a number of these post-mortem examination revealed the lesions of congenital syphilis. In others septic infection occasioned by the gonococcus was the primary cause of the bleeding. In others a meningitis had developed without lesions of syphilis. No cause other than a mechanical one from pressure upon the head, or excessive coughing or straining, could be found for the condition. He also reports several cases of bleeding from the nose in infants, in which bacteriological examination showed the presence of the bacillus of diphtheria as a cause. His interesting paper serves to illustrate the fact that melæna is a symptom only, whose cause must always be sought before the pathology or treatment of a given case becomes evident.

KNOEPFELMACHER has studied the icterus of the newborn, and the relation which the condition of the red blood-cells bears to this phenomenon. His conclusions are essentially as follows: in the first weeks of life the number of red blood-cells is not influenced by a condition of icterus. Variations in the number of red corpuscles depend upon changes in the quantity and quality of the blood-plasma. The resisting power of the red corpuscles at birth seems to be fully that possessed by these cells in the adult, and does not seem to be lessened by icterus, however intense. The microscopic examination of the blood of the newborn in these cases shows, during the first days of life, no sign of erythrocytes, but, on the contrary, gives only indications of a vigorous building-up of red blood-cells. The conclusion of these studies is in general that the condition of icterus in the newborn does not influence essentially the red blood-cells.

Purpura Hemorrhagica in a Newborn Child with Congenital Syphilis.—In the *Revue Mensuelle des Maladies de l'Enfance*, November, 1896, JOLLY reports the case of an infant, nineteen days old, who died of purpura hemorrhagica, in whom autopsy showed intestinal ulceration and lesions characteristic of congenital syphilis. Other possible causes of these phenomena were carefully excluded in making a diagnosis.

The Use of the Phonendoscope in Obstetric Diagnosis.—In the *Prager medicinische Wochenschrift*, 1896, No. 46, KNAPP reports his observations in the use of this instrument. He agrees with PRIBRAM in the value of the instrument, and has found it especially useful in diagnosticating twin pregnancy, and also in detecting coiling of the cord about the fœtus. When a murmur can be located over the fœtus a little slower than the fœtal pulse, but more rapid than the maternal aorta, and differentiated from the placental *bruit*, a diagnosis of coiling of the cord about the fœtus may be considered as reasonably certain. In twin-pregnancy the two heart-sounds may be more readily diagnosticated by this means. The location of the placenta can also be ascertained by the use of the phonendoscope.

Symphysiotomy.—In the *Edinburgh Medical Journal*, December, 1896, DONALD reports three symphysiotomies. The first was upon a multipara who had borne five children, four of them stillborn. A general contraction of the pelvis is said to have been present, with a true conjugate of three and one-quarter inches. The patient was admitted to the hospital in the second

stage of labor, and no progress was made for three hours, although the pains were strong. The joint was opened by an incision above the pubes, the joint-surfaces separating nearly an inch. The head was adjusted to the brim and easily delivered by axis-traction forceps. The extent of separation during delivery was about two and one-half inches. The child was of average size, and a healthy female. Buried silk sutures were employed in the periosteum and the skin was closed with silkworm-gut. The pelvis was strapped, a firm bandage applied, and sandbags placed on each side of the pelvis. The patient left the hospital at the end of six weeks in good condition.

Case II. was in her second labor, the first having been terminated by the birth of a stillborn child with forceps. The pelvis was of the same type as the preceding. She was admitted to the hospital, having been in labor for twenty-four hours. The cervix was widely dilated, the head not engaged, the heart-sounds distinct. After symphysiotomy the delivery was difficult, the bones separating fully two and three-quarters inches. A living female child of average size was extracted. The patient's convalescence was somewhat hindered by swelling and suppuration of the labia. The patient was up in four weeks, and the final result was good.

Case III. was a multipara who had lost six children through embryotomy, premature labor, and tedious spontaneous labor. The true conjugate was three and one-quarter inches. Patient admitted to hospital in labor, the membranes having ruptured sixty hours before admission. As dilatation was but partly complete, de Ribes's bag was employed. The pubes separated about two inches during delivery. A puny male child was born, which required resuscitation. Patient got up in nineteen days, but was kept in hospital on account of the illness of the child. The infant developed congenital syphilis and died three months after birth.

In the *Boston Medical and Surgical Journal*, December 17, 1896, SWIFT reports the first symphysiotomy performed in Boston or vicinity. The patient was in her second labor, having been delivered of her first child by craniotomy. The patient had been in labor about twenty-four hours; the os was fully dilated and the membranes ruptured. The pelvis was symmetrically contracted, the external conjugate being seven and one-half inches. The true conjugate was estimated at about three inches. The patient was taken to a hospital and symphysiotomy performed by suprapubic incision. The patient was delivered by forceps, the pubic bones separating about one and one-half inches. The child was resuscitated without difficulty. The pelvis was brought together by firm pressure, and a heavy silk suture passed through the bones, a wire suture having broken. The pelvis was fixed by a broad band of adhesive plaster. A self-retaining catheter was placed in the bladder. The incision healed on the fifth day, and abscess formed in the line of incision. This was readily emptied, and occasioned but slight disturbance. The patient nursed her child. In the discussion which followed the report of this case the balance of opinion was in favor of Cæsarean section as being the less dangerous and more feasible operation. It was recognized that a field for symphysiotomy exists in well-chosen cases.

In the *Medical News*, January 16, 1897, the writer reported a symphysiotomy, performed in January, 1896, upon a patient whose first child had

been delivered with difficulty by forceps. This child survived. Spontaneous labor in the second instance had failed, and the physician in attendance had not succeeded in delivering with forceps. The head was but partially engaged; the heart-sounds were very rapid. The pelvis was symmetrical in contour, but contracted in all its diameters from one-half to two cm. The ground for symphysiotomy was disproportion between the pelvis and the fœtus, due not only to the pelvic contraction, but to the increase in the size which the fœtus displays in repeated pregnancy. The heart-sounds of the fœtus were very rapid, but distinct. Symphysiotomy was performed by suprapubic incision, the joint being readily opened with a bistoury. The occiput rotated posteriorly, and the child was delivered with axis-traction forceps. It was a male, weighing eight pounds, its measurements in several of the diameters of its head being from one-half to one cm. above the average. A very perceptible odor was noticed when the child was delivered; it survived eighteen hours, perishing from inspiration-pneumonia. The mother developed sapræmia, but made a good recovery. A slight discharge of sanious fluid issued from the incision for several days. She made a complete recovery and left the hospital seven weeks after admission. Subsequent measurement of her pelvis showed an increase in its diameters of one-half cm. One year after operation she was in excellent health, never having experienced the slightest inconvenience from the condition of the pelvis. Sound union in the pubes followed the operation.

GYNECOLOGY.

UNDER THE CHARGE OF

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Etiology and Treatment of Cancer of the Uterus.—BAECKER (*Archiv für Gynäkologie*, Band liii. Heft 1), from an analysis of 705 cases of cancer of the uterus, arrives at the following conclusions with reference to the etiology of the disease:

1. The true origin of malignant disease of the uterus is as yet unknown, nor can it be referred to a specific micro-organism. 2. The indirect cause is endometritis, generally of puerperal origin, which furnishes a suitable nidus for its development. This is shown by the fact that cancer is common in women who have borne children, while it is comparatively rare in single and in sterile women, as well as in those who have had gonorrhœa. Moreover, in nearly every case of cancer there is a chronic catarrh of the endometrium. Endometritis is the primary condition, malignant degeneration being secondary. Hence the practical importance of treating endometritis actively from the outset as a prophylactic measure.

In the treatment of carcinoma of the cervix total extirpation is always

preferable to high amputation, because in leaving behind the body of the uterus the surgeon leaves a chronic endometritis which furnishes a favorable nidus for the development of malignant disease, even if the latter is not already present.

Primary Cancer of the Fallopian Tubes.—ECKARDT (*Ibid.*) reports the following case of primary alveolar cancer of the tube, the fifth on record. Twelve other reported cases were of the papillary variety.

The patient, a multipara, aged forty-five years, had complained for four weeks of pains in the back and abdomen, with loss of appetite and rapid emaciation. On entering the hospital she was very pale; the abdomen was tender on pressure, and on vaginal examination a nodular mass the size of a child's head was felt in Douglas's pouch.

On opening the abdomen the tumor was found to be universally adherent; on separating it, it tore apart and a quantity of soft, brain-like material escaped from its interior. The left adnexa were normal. Examination of the specimen showed that it consisted of the enlarged right tube, the corresponding ovary being normal, as well as the uterine end of the tube. Microscopically the structure showed the papillary-alveolar type. There was no evidence of chronic salpingitis. It is impossible, according to the writer, to diagnosticate this condition before opening the abdomen. Total extirpation of the uterus and adnexa is preferable to salpingotomy.

Emphysema of the Skin following Cœliotomy.—HEIL (*Archiv für Gynäkologie*, Band lii. Heft 3) reports this interesting case, nine others having been recorded. On the third day after a Porro operation (the abdominal incision having been closed with deep and superficial sutures) emphysema developed along both edges of the wound. By the eighth day it had disappeared on the left side, but on the right it extended to the iliac region, when it gradually subsided, no trace of it remaining four days later.

Madlener affirms that Trendelenburg's position favors the development of emphysema, as air is drawn into the abdominal cavity by the upward movement of the intestines and diaphragm; hence he advises that the sutures should not be tied until the patient has been lowered to a horizontal posture. Gräfe advises that the abdomen should always be compressed by an assistant before sutures are tied. However, in cases reported by Leopold and Brosin the patient remained in the horizontal position throughout the operation.

The writer believes that emphysema is due entirely to imperfect approximation of the deeper layers of the abdominal wall, with firm union of the skin. This he demonstrated clearly by experiments on rabbits. To avoid emphysema, he concludes, as well as hernia, exact approximation of the recti and their sheaths is all-important, the position of the patient being a minor consideration.

Hypertrophy of the Cervix Uteri in a Virgin.—HELME (*British Medical Journal*, December 26, 1896) describes a case of hypertrophy of the cervix in an unmarried woman, aged twenty-one years. The fundus uteri was at

nearly its normal level, while the cervix protruded from the vulva, a sound passing to the depth of four and one-half inches.

The following operation was performed: a circular incision was carried around the cervix at the level of the vesical attachment, and lateral incisions were made on either side parallel with the bases of the broad ligaments. The cervix was then freed as in the preliminary step of vaginal hysterectomy and both uterine arteries (including the cervical branches) were ligated, in order to cut off the blood-supply from the hypertrophied part. The cervix was drawn forcibly downward and transfixed antero-posteriorly with silver wire. Circular amputation was performed, followed by bilateral section of the cervix, forming anterior and posterior flaps. The vaginal and cervical mucous membranes were united, and lastly the cervix was sutured to the edge of the vaginal wound on either side.

The stitches were removed on the ninth day and the patient was discharged at the end of the third week. When examined six weeks after the operation the canal was patent and the uterus measured two and three-quarters inches.

Bicycling for Women.—THEILHABER (*Münchener med. Wochenschrift*, 1896, No. 48) recommends cycling in cases of amenorrhœa, especially when the uterus is undeveloped. Dysmenorrhœa of nervous origin in young girls and sterile women is often relieved. In endometritis the writer has seen no result, either favorable or unfavorable, from this form of exercise; in the hemorrhagic form he advises against it on theoretical grounds. It should be forbidden in chronic as well as in acute gonorrhœa, in salpingitis, and in subacute and chronic peritonitis of whatsoever origin.

Flexions and versions do not constitute a contraindication; in fact, cycling is often recommended for patients with these conditions with the view of relieving nervous symptoms and strengthening flabby muscles rather than actually relieving the displacement. This may account for the good results claimed in some cases of partial prolapsus.

The use of the bicycle is inadmissible by patients with fibroid and ovarian tumors. The writer notes the rapid increase in size of fibroids in two women who rode contrary to his advice. Bladder-troubles are usually aggravated by cycling, though on this point there is some difference of opinion. Hemorrhoids are sometimes relieved, but are sometimes made worse, especially when improper saddles are used. Such benefit as may be experienced is usually due to the relief of constipation. Women ought not to ride during menstruation, though the writer admits that several of his patients had done so without injury. Pregnancy is a positive contraindication. Two of the patients who disobeyed his injunction aborted, but a third went on to full term, though she had a retroflexed uterus and prolapsed ovaries.

In general, he approves of cycling in moderation.

H. MACNAUGHTON JONES (*Medical Press*, November 4, 1896) calls attention to the fact that cycling may have an injurious effect on women at the time of the menopause, and should not be indulged in except on the advice of a physician, especially if the patient is anæmic and has functional cardiac trouble. He doubts the propriety of women with retrodisplacements of the uterus riding, with or without pessaries; this applies especially to anæmic young girls. Hemorrhoids are aggravated, and coccygodynia may result.

The writer recommends a pneumatic saddle, so constructed as to support the ischia, but not to press upon the external genitals or the coccyx; there should be no projection under the pubes. He approves highly of this form of exercise, which he regards as far superior to massage.

PÆDIATRICS.

UNDER THE CHARGE OF

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A Simple Means of Throat-examination.—MILLIGAN (*Medical Record*, November 21, 1896, p. 765) suggests as an improvement upon the usual spoon-handle or depressor for examining a child's throat, the use of the child's own index-finger. Almost any child over three years of age can be quickly taught to slip his own finger along the tongue as near the base as possible, with the injunction to open the mouth wide and press down the tongue. The advantages of this method are that the child does not fear injury from his own finger; that his own effort will not provoke emesis or straining; and that there is no danger of contamination by a dirty spoon or depressor, and no possibility of autoinfection. This plan is, of course, impracticable in the moribund and in infants, but at least 95 per cent. of all cases of acute and chronic diseases of the throat or of foreign bodies can be more successfully examined by it than by any other method.

Somatose as a Galactagogue.—DREWS (*Journal de Clinique et de Thérapeutique Infantiles*, 1896) refers to the unsatisfactory character of all plans of treatment previously advocated for the purpose of preserving or increasing the supply of maternal milk. His attention was first drawn to somatose by the quite unexpected effect of its use by a mother in the third month of lactation, one of whose breasts was dry and the other failing. Under the use of a teaspoonful of somatose three times a day in a cupful of warm milk the woman began to gain in weight, and the breasts filled and yielded such an abundance of milk that nursing was continued into the seventh month. Discontinuance of the somatose for a few days, in spite of maintenance of good appetite, was followed by diminution of secretion and a return of symptoms. Twenty-five cases have been treated by the author in a similar manner, almost uniformly with the same favorable results.

A Case of Pre-natal Cerebral Palsy of the Arm.—PLACZEK presented to the Medical Society of Berlin at its meeting of June 17, 1896 (*Revue mensuelle des Maladies de l'Enfance*, September, 1896) a newborn infant seen the

day after birth for a palsy of the arm. The labor had been terminated by nature without undue delay. Spontaneous movements of the forearm were wanting in pronation and flexion, only slight movements of the fingers being observed, coupled with resistance when efforts were made to open the hand. The electrical reactions were normal on the two sides; sensation was difficult to estimate in so young an infant. The lower limbs and the skeleton showed no abnormality. The idea of the cerebral origin of the palsy was corroborated by the fact that the brother of this child had an infantile cerebral palsy. Several months before delivery the mother had received a violent blow upon the abdomen, and it was supposed that the fœtal head had been injured through the abdominal wall and that the arm-centre had been affected.

Gangrene of the Penis after Ritual Circumcision.—BROTHERS (*Medical Record*, January 30, 1897) records a case under this title in which death from septicæmia followed the ritual operation at the hands of the *mohel*. The child was born under Dr. Brothers's care and was in perfect health when his visits ceased on the ninth day. Circumcision was done on the tenth day by the usual methods followed in the religious rite. Several hours after the operation severe hemorrhage occurred, which was checked after considerable labor and four hours' active work by the religious operator, who declined the services of a physician. Forty-eight hours later the author was called to find the baby feverish, refusing to nurse, and vomiting from time to time, occasionally with blood, and in distinct collapse. The bladder was found to be distended, extending half-way up to the umbilicus. The anterior portion of the penis was in a condition of dry gangrene, presenting a black, hard, cylindrical mass about three-quarters of an inch in length, the cause of which was discovered to be a narrow strip of gauze, evidently saturated with some styptic, and tightly constricting the organ. The urethral orifice could not be discovered, and the retention was not relieved until the gangrenous tissue was freely cut away. Death occurred on the thirteenth day after the operation.

Acute Gastro-intestinal Septicæmia in Childhood.—COMBY (*Médecine Moderne*, November 11, 1896, p. 689) calls attention to the existence among children, from four to eight years of age, of a form of gastro-enteritis which has exactly the course and gravity of a cholera infantum. It follows sometimes the ingestion of food bad in quality or improper for the age of the child, sometimes without known cause. It begins as a febrile indigestion, but suddenly diarrhœa begins, vomiting becomes uncontrollable, the facies of cholera appears, and the child dies in three or four days. Fever may be wanting from the beginning. The knowledge of this condition is important, for with children of this age the gravity of the condition may not be suspected at the beginning; and even the most energetic treatment, with lavage of the stomach and intestines, injection of artificial serum, etc., may utterly fail.

Cases of Fatal Epistaxis.—SWOBODA (*Wiener klin. Wochenschrift*, 1896, No. 41, p. 916) records four instances of fatal epistaxis in nurslings less than a month old, which, to superficial observation, exhibited a typical picture of

melæna, with black stools, vomiting of blood, and blood in the mouth. Two of the infants had hereditary syphilis, and at the autopsy were found to have nasal diphtheria. With the third child the nasal bleeding complicated buccal hemorrhage and purpura following a purulent rhinitis consecutive to a bilateral blennorrhagic ophthalmia. At the autopsy there was found almost complete destruction of the nasal mucosa, laying bare the bone. In this case, as in the two preceding ones, the author thinks that the hemorrhagic state was due to an infection. In the last case the nasal hemorrhage could be attributed to no definite cause. The mucosa was found to be simply congested and tumefied. Beneath the dura was found a clot covering almost the entire left hemisphere. In this case the author believes that the circulatory disturbances provoked by the intracranial hemorrhage had produced congestion and rupture of vessels in the nasal fossæ. In all these cases the bleeding had not appeared externally, but had passed by way of the nasopharynx into the stomach, and had not the source of hemorrhage been discovered by careful examination the mistaken diagnosis of melæna could easily have been made.

A Method of Home-modification of Cow's Milk for Infant-feeding.—DUFOUR (*Revue Mensuelle des Maladies de l'Enfance*, September, 1896, p. 431) describes a rather simple method of humanizing cow's milk that has been adopted at a dispensary in Fécamp fancifully named *l'Œuvre de la Goutte de Lait*. The basis of the method is Marchand's analyses as given in his thesis in 1874 (*Du lait et de l'allaitement*, Paris, 1874), which differ in some important respects from the later and more generally accepted ones now employed. According to Marchand, human milk contains 3.68 fat, 7.11 lactose, and 1.70 proteids; while cow's milk gives 3.72 fat, 5.03 lactose, and 2.31 proteids. [The proteid value of cow's milk is here very low as compared with Leeds's, 3.76, and Rotch's, 4.00. The principle, however, remains the same, and the amounts can readily be calculated for a milk of richer proteid value.] A glass vessel, holding about two litres and fitted below with a simple tap guarded by a compressible rubber spigot, receives the amount of milk required for the daily ration, and is then closed by a rubber covering and set away for four hours under proper conditions of temperature varying with the season. The cover is then removed, and one-third of the lower milk is drawn off. The proteids and salts have thus been diminished one-third. [This, however, does not reduce the proteids of the cream.] The bulk of milk withdrawn is then replaced by pure water containing in solution 35 grammes of lactose per litre. This quantity of sugar represents the difference between the 50 grammes of lactose in the cow's milk and the 70 grammes in human milk, plus the third in the cow's milk withdrawn (about 15 grammes). To the lactose is also added one gramme of table-salt per litre. The mixture is then thoroughly shaken and poured into the feeding-bottles to be sterilized. The author naively adds that some children bear well the addition of several coffee-spoonfuls of fresh cream to the daily ration, and this is found to be necessary when the weight does not show a satisfactory gain. At the "Drop of Milk" this method has been somewhat modified for wholesale manipulation. The milk is diluted with one-third of water, and to each litre of the mixture are added 15 to 20 grammes of fresh

cream, 35 grammes of lactose, and 1 of chloride of sodium. [The amount of cream here added produces 4 per cent. or more of fat, which brings the mixture to a richness equalling that of the later analyses.] This preparation is used in all cases, the amount alone varying with the child's age. The practical results of this feeding are said to be eminently satisfactory.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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Embolism of the Abdominal Aorta.—CHARRIER and APERT report a remarkable case of endocarditis in a woman, aged fifty-one years, which terminated fatally after complete occlusion of the aorta and of the left Sylvian artery by emboli, detached apparently from a large cardiac thrombus (*Bulletins de la Société Anatomique de Paris*, 1896, No. 21, 766). Twenty years before she had been laid up for a month with acute articular rheumatism, which was complicated by cardiac disease, and she had been troubled off and on since that time with symptoms referable to a valvular lesion of the heart. This, examination showed to be pronounced mitral stenosis. Nine days after her admission to the Hôtel-Dieu she was suddenly seized with severe pain in the left leg, which almost at once became pale and cold and showed complete loss of sensation. At the same time there was slight elevation of temperature, and the affected region of the leg assumed a violet color, and soon came to resemble a limb affected with phlebitis. Six days later the other leg became similarly affected, but returned to its normal appearance after twenty-four hours. Two weeks later cerebral embolism occurred, with resultant right hemiplegia and complete motor aphasia. Soon after the cerebral embolism a line of demarcation about the middle of the left leg separated the lower gangrenous portion. At about the same time control was lost of the bladder and rectum, and a bedsore developed a few days before the patient's death.

The autopsy revealed a very marked degree of mitral stenosis, with great dilatation of the left auricle, in which a large white thrombus was found. The left Sylvian artery was found completely occluded near its origin by an embolus showing a structure similar to that of the auricular thrombus. Acute softening of the portion of the brain supplied by the occluded artery had occurred. But the most remarkable lesion was the complete occlusion of the abdominal aorta just below the point of origin of the inferior mesenteric artery by a large embolus. Below this point thrombosis had occurred, the clot extending on the right side throughout the entire length of the external and internal iliac arteries to the point of origin of the circumflex

and epigastric arteries from the external iliac. On the left side the clot had extended even further, occluding the femoral artery as far as its bifurcation. Below these points the arteries appeared normal. Thrombosis had also taken place above the embolus in the aorta, extending up beyond the point of origin of the renal arteries, and, on the left side, into the renal artery itself; but these thrombi only partially filled the aorta and renal artery, permitting consequently a very considerable blood-supply to the kidneys and inferior mesenteric artery. Nevertheless, numerous infarctions were found in the kidneys.

The recovery noted in the right leg after the appearance of symptoms of thrombosis in its vessels is attributed to the establishment of collateral circulation through the epigastric and circumflex arteries, which, it will be remembered, escaped thrombosis on that side of the body.

Stimulated by this remarkable case, Charrier and Apert searched the literature for reports of similar embolic occlusions of the abdominal aorta, with the result that ten were found. These they have tabulated in connection with their own case.

Thrombosis of the Vena Cava Inferior.—WALLGREN reports a case in which death was caused by extensive thrombosis of the vena cava inferior and of its tributaries. The thrombus apparently had its origin in a spot of inflammation in the wall of the vena cava near the entrance of the hepatic veins, due to an inflammatory process between the liver and the diaphragm. This resulted in the formation of a mass of cicatricial tissue which involved the wall of the vena cava by extension. The vena cava was occluded throughout its entire length below the diaphragm, the clot extending also into the renal, iliac, and femoral veins, and to a less extent into the hepatics. Microscopic examination showed organization of the upper portion of the thrombus in the vena cava and in the neighboring hepatic veins; but the lower portion of the thrombus was unorganized, indicating that this portion of it had formed only a short time before death.

Twenty-seven similar cases of thrombosis of the inferior vena cava collected from the literature of the subject are discussed by Wallgren in so far as they serve to throw light on the etiology of the condition.—*Finska Läkaresällskapets Handlingar*, 1895, xxxviii. *Cf. Centralblatt f. Pathologie*, 1896, vii. 933.

Tuberculous Infection through Ingestion of the Bacilli.—An experimental investigation by PROF. STRAUSS of the effects upon guinea-pigs and rabbits of the ingestion of pure cultures of the tubercle-bacillus, made primarily in the hope of ascertaining further points of distinction between human and aviary tuberculosis, has incidentally yielded a number of interesting facts relative to tuberculous infection through the alimentary tract (*Archives de Médecine expérimentale et d' Anatomie Pathologique*, 1896, viii. 689). The present study is in a measure a sequel of an investigation by Strauss and Wurtz in 1888, in the course of which it was determined that chickens possess a very remarkable resistance to human tubercle-bacilli, even when ingested in very large numbers. Thus, one chicken, which had been the subject of experiment for a year and which was afterward dissected before the

Congrès pour l'Étude de la Tuberculose (1888), was calculated to have swallowed during that time not less than one hundred pounds of tuberculous sputum. And still this and all the other chickens were found to have remained unaffected by the disease. As chickens are readily susceptible to bird-tuberculosis, a distinct difference in the pathogenic quality of the two varieties of the tubercle-bacillus was demonstrated, and it was evidently to test them further in this particular that the present investigation was undertaken.

In the present instance guinea-pigs and rabbits were made use of, and large numbers of bacilli from pure cultures were directly introduced into their stomachs with the aid of a soft catheter. As has been said, both human and aviary tuberculosis were employed in the experiments, and here again striking differences were found to exist between them. In the guinea-pigs the introduction of a single large dose of human bacilli was always followed by a widespread tuberculosis. The animals lost weight steadily and died in from six to twelve weeks. The autopsies upon them showed extensive tubercular lesions of the cæcum, of the colon, and lower portion of the ileum, of the mesenteric lymph-nodes, of the spleen and liver, and often also of the lungs. The stomach and upper portion of the small intestine escaped in almost all cases.

In marked contrast to this were the results which followed the ingestion of the germs of bird-tuberculosis. Here the guinea-pigs remained apparently healthy, in some instances even gaining in weight, and the examinations made after killing them disclosed in most instances no evidence of tuberculosis. That the bacilli found their way into the tissues was shown by the fact that a few slight lesions in which bacilli were abundantly present were found in the cæcum, spleen, liver, and lungs. It is interesting to note that these bacilli, though they had produced little or no effect upon guinea-pigs, when introduced into chickens set up a most pronounced and characteristic tuberculous process.

In the rabbits the differences in the effects resulting from the ingestion of the two varieties of the bacilli were much less pronounced. In either case the ingestion of large amounts of pure cultures of the bacilli produced no visible effect upon the health of the animals, and when they were killed at the end of three or four months no other lesion was found than an eruption of tubercles about the opening of the ileum into the cæcum and in the vermiform appendix, this peculiar localization of the lesion being accounted for by the abundance of solitary lymph-nodules in the regions named.

While, therefore, there would seem to be no great difference in the susceptibility of the rabbit to the two varieties of the tubercle-bacillus under discussion, it is equally clear that this is quite otherwise in the case of the guinea-pig, which quickly succumbs to the human variety, while showing great resistance to the bird variety.

But several other facts of interest were also determined by these experiments. The distribution of the lesions in the guinea-pigs affected with human tuberculosis contrasts distinctly with that met with in cases in which the germs have found entrance to the body through the air-passages; for, while the lungs were occasionally affected in Strauss's experiments, this appeared to occur only in cases in which the infectious material had been

present in such large amount as to have either passed through the liver or to have been carried up to the thoracic viscera through the thoracic duct. Indeed, the picture presented by the lesions in Strauss's guinea-pigs bears a striking resemblance to that occasionally met with in children who have died of tuberculosis apparently of alimentary origin.

That only a comparatively small number of the bacilli ingested found their way into the tissues was shown by the fact that large numbers of them were discharged in the feces during the eight or ten days following their ingestion. After absence from the feces for about a month they could again be detected with considerable constancy after the formation of intestinal ulcerations, but while, in the first instance, they were single, as a rule, upon their reappearance they were found to be usually in clumps of considerable size.

Finally, these experiments afford further proof of the ability of the tubercle-bacilli to pass through healthy mucous membranes, more particularly along the course of the lymphatic absorbent apparatus, this last being indicated by the limitation of the intestinal lesion, in many of the cases, to the solitary lymph-nodules of the lower ileum and cæcum.

Intrauterine Mixed Infection in Typhoid Fever.—Numerous cases are now on record of infection of the fœtus in utero from the blood of the mother suffering from typhoid fever; but in all the cases thus far reported the typhoid bacillus alone was found to have been the cause of the infection. A case recently reported by DÜRCK, in which the *staphylococcus pyogenes albus* was associated with the typhoid bacillus, is consequently of considerable interest (*Münch. med. Woch.*, 1896, No. 36). The child was a well-developed boy, who had been carried nearly to the completion of the normal period of gestation. He died almost immediately after birth, showing on examination a slight accumulation of cloudy serum in the peritoneal cavity and enlargement of the spleen. Cultures from the liver and spleen made immediately on opening the body developed the typhoid bacillus and the staphylococcus above mentioned. Sections from the spleen showed the same bacteria scattered through the pulp. The staphylococci were more numerous than the bacilli, both in the organs and in the cultures.

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